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ABSTRACT

This module was designed to assist educators in facilitating learning in health careers outside nursing. It may be used for classroom, on-the-job, or independent study. The module is oranized in 13 units. Each unit includes one or more lessons that contain the following components: scope of unit, unit objectives; student's information assignment, reference resources used by instructor, introduction, outline, summary and conclusion, information items, classroom/laboratory activities, and evaluation items. The units cover the following topics: introduction to radiology, terminology related to radiology, telephone techniques, radiology department records, darkroom procedure, radiation and radiation safety, infection control, transporting patients, patient preparation for examination, radiology procedures, equipment identification, equipment cleaning and maintenance, and computer basics and application. References, a competency certificate, and a competency profile complete the module. (KC)

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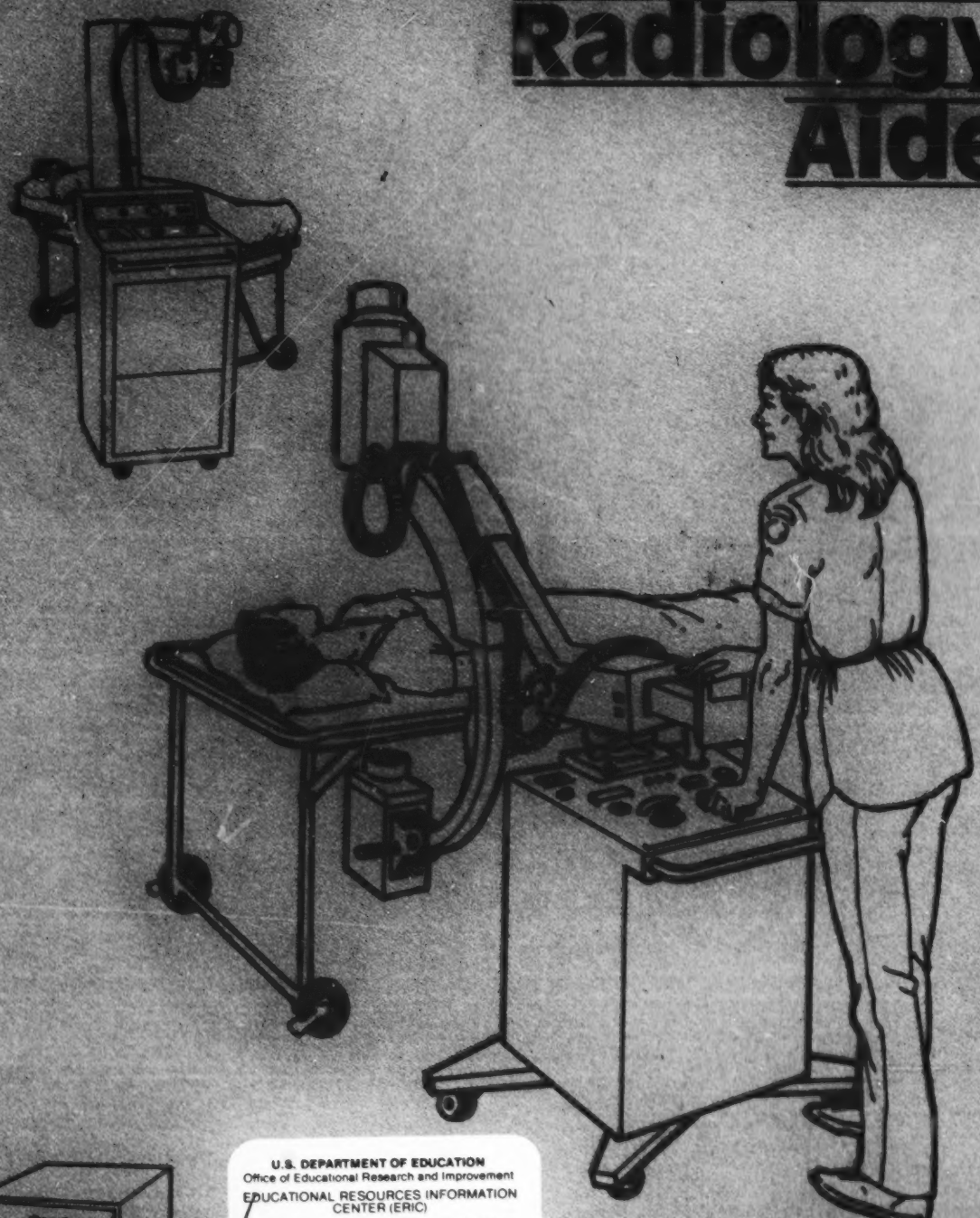
Radiology Aide



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RADIOLOGY AIDE

Instructor's Guide

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Produced by the Instructional Materials Laboratory
University of Missouri-Columbia
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PREFACE

This module was developed through combined efforts of dedicated individuals who are involved in the educational preparation of health care workers. Educators from both adult preparatory and postsecondary vocational programs cooperated in the design of a content outline from which this module ultimately evolved. The content outline identifies the tasks an aide-level worker in this career field would perform. Lesson plans are prepared to provide instruction for each of the tasks. The end product is an instructional module to assist Health Services Assistant educators to facilitate learning in health careers outside of nursing. With nursing being the Health Services Assistant educator's expertise, the result is limited insight into allied health careers. This module will function as a mechanism to provide instruction that would otherwise be lacking.

The module may be used to:

1) Provide classroom instruction by the Health Services Assistant instructor, or
2) Assist assigned staff to provide on-the-job instruction, or
3) Provide selected units for independent study.

It is hoped that a combination of all three applications will be utilized.

The lesson plans allow the curriculum guide to be prepared in short, manageable segments. Each lesson contains the following components:

SCOPE OF UNIT

A teacher-centered statement that includes the goals of the unit; allows the reader to see the comprehensive content of each lesson

LESSON OBJECTIVES

A listing of skills the student will be able to perform as a result of the lesson; provides the basis for evaluation

INFORMATION ASSIGNMENT

An assignment for which the student is responsible

REFERENCE

Resources the instructor uses to support the unit content

INTRODUCTION

A statement that sets the stage for the learning of the content; tells the student why the lesson is important

OUTLINE

The content of the lesson; may be informative in nature or it may be the steps of a procedure to learn a skill

SUMMARY AND CONCLUSION

Reassimilates all of the information that was included in the content of the lesson; ties all of the information together in a comprehensive overview; purpose is to reinforce learning by summarizing the major components of the lesson

INTERACTION ITEMS

Questions intended to stimulate and encourage student interaction during the unit presentation; allow the instructor to build on students' previous learning as well as dispel any misconceptions

CLASSROOM/LABORATORY ACTIVITIES

Activities designed to reinforce learning; allow students to interact with the new information or materials contained in the lesson

EVALUATION ITEMS

An exercise designed to measure the accomplishment of the lesson objectives; may be a written evaluation or skills demonstration

The module becomes individualized when the instructor includes his/her program's philosophy and unique teaching style. Additional content may be added to increase the scope of the unit if it better serves individual programs.

The dedication with which this course was developed reflects the sincere desire of the Health Occupations Education community to provide a solid basic educational foundation for beginning students in health careers.

RADIOLOGY AIDE

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	2. Suffixes/prefixes/word roots
	3. Terms and procedures used in radiology
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DEMONSTRATION	INFORMATION
INFECTION CONTROL	
	10. Microbiology, microorganisms, and basic terminology of infection control
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PATIENT PREPARATION FOR EXAMINATION	
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EQUIPMENT IDENTIFICATION	
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DEMONSTRATION INFORMATION

EQUIPMENT CLEANING AND MAINTENANCE

19. Equipment cleaning and maintenance

COMPUTER BASICS AND APPLICATION

20. Computer basics and application

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT 1 INTRODUCTION TO RADIOLOGY

SCOPE OF UNIT:

This unit covers the discovery of x-rays, including the early uses of x-ray. It also provides the student with information about the characteristics of radiation and how x-rays are produced.

INFORMATION TOPIC: X OR DEMONSTRATION:

HISTORY AND OVERVIEW
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. State the name of the scientist who discovered x-rays and the date of discovery.
2. Describe the nature of x-radiation by listing at least four characteristics of this energy.
3. Explain how x-rays are produced.
4. List steps in the production of a radiograph.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. HO 1: The Discovery of X-rays

INFORMATIONAL ASSIGNMENT: (Student)

HO 1: The Discovery of X-rays

REFERENCES: (Instructor's Additional Information)

Gurley, LaVerne and William J. Callaway. Introduction to Radiologic Technology. St. Louis: C.V. Mosby Publishing Company, 1985.

INTRODUCTION:

Modern radiology departments play an important and critical role in diagnosis of virtually all disease processes and abnormal conditions known to man. Through the use of medical images of the body, its tissues, and fluids, we are able to detect disease processes much earlier than before. Additionally, traumatic injuries and abnormal conditions can be clearly defined through the use of modern imaging equipment, allowing the physician to better diagnose and treat patients. All of the new and fascinating x-ray equipment would not be around today were it not for the discovery of the energy that is used to help generate these images.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT 1 INTRODUCTION TO RADIOLOGY

OUTLINE: (Key Points)

I. Discovery of X-rays (HO 1)

A. Date: November 8, 1895

B. Physicist Wilhelm Konrad Roentgen discovered and named this energy

INSTRUCTOR NOTE: Read and discuss HO 1 with class

II. Characteristics of Radiation

A. Difference between gamma radiation and x-radiation

1. Gamma radiation comes from atoms of radioactive elements like uranium or plutonium. Gamma radiation can only occur with the decay (breakdown) of atoms.

2. X-rays are produced when electrons traveling at high speed strike certain materials, usually heavy metals. The electrons can be produced with an electronic tube called an x-ray tube similar to the tube that Roentgen used in his experiments.

B. Beyond the difference in how each of these energies occur, x-rays and gamma rays have these same characteristics or properties:

1. Cannot be detected by sense of sight, smell or taste

2. Travel through air at or near the speed of light

3. Affect photographic film

4. Cause certain luminescent materials to give off light when activated by these energies

5. Travel in straight lines

III. Steps in the Production of a Radiograph

A. Required materials:

1. X-ray tube

2. Sheet of film

3. Object to x-ray

B. Radiation passes through the object (or body part) and reaches the film contained inside a light-tight holder, called the film cassette.

C. The film is developed by a method similar to development of photographs.

D. The result is a radiograph.

IV. Summary and Conclusion

A. Discovery of x-rays

B. Characteristics of radiation

C. Steps in the production of a radiograph

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT 1 INTRODUCTION TO RADIOLOGY

INTERACTION ITEMS:

1. Why did Roentgen cover the tube with cardboard when he was doing his experiment?

2. Why is it important to know the characteristics of radiation?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT 1 INTRODUCTION TO RADIOLOGY

EVALUATION ITEMS

1. _____, a German physicist, discovered x-rays on _____ (date).

2. List four characteristics of x-rays:

   a.

   b.

   c.

   d.

3. How are x-rays produced? (Circle a or b.)

   a. X-rays occur when high speed electrons strike certain materials, usually heavy metals.

   b. X-rays occur when atoms break apart (called decay) and emit the energy that held the atom together.

4. Briefly explain how a radiograph is produced.

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LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT 1 INTRODUCTION TO RADIOLOGY

ANSWERS TO EVALUATION ITEMS

1. Wilhelm Konrad Roentgen
   November 8, 1985

2. Any four of the following:

   a. Cannot be detected by sense of sight, smell or taste

   b. Travel through air at or near the speed of light

   c. Affect photographic film

   d. Cause certain luminescent chemicals to give off light when struck by these energies

   e. Travel in straight lines

3. a.

4. Radiation passes through the object (or body part) and reaches the film contained inside a light-tight holder called the film cassette. The film is developed by a method similar to development of photographs. The result is a radiograph.

THE DISCOVERY OF X-RAYS

Wilhelm Konrad Roentgen (rent'-găn), the German physicist who discovered x-rays, was born in Lennep, Prussia, in 1845 and died in 1923. A professor of physics at several German universities, Roentgen was doing research at Worzburg when he made his discovery of x-rays on November 8th, 1895. As he was experimenting with the conduction of electricity through gases in exhausted vacuum (cathode ray) tubes, he became interested in the luminescence that cathode rays caused in certain chemicals. To see better, he darkened the room and enclosed the cathode-ray tube in black paper. Later he wrote this about his discovery:

> "I was working with a Crookes tube covered with a shield of black cardboard. A piece of barium platino-cyanide paper lay on the bench and I noted a peculiar line across the paper... In a few minutes there was no doubt about it, rays of energy were coming from the tube... This is something new and unknown to man."

Roentgen decided that an invisible radiation from the cathode tube penetrated many substances opaque to the passage of ordinary light. He found by experimentation that the radiation could pass through thick paper, flesh, and even thin metal, but was stopped by other materials such as metal or bone. He called the unknown radiation x-rays, since the letter "X" frequently stands for an unknown quantity in mathematics.

He immediately began to experiment with his fascinating discovery, hoping to publish his findings before someone else did. For seven weeks Roentgen worked day and night to gather as much data as he could. Finally, in December of 1895 he published his paper on x-rays. He gave his first public showing of the mysterious energy in January of 1896, taking an x-ray photograph, now called a radiograph, of the hand of a 79 year-old colleague. News of this phenomenon flooded Europe and America and his discovery became a useful diagnostic tool of physicians almost immediately.

It was found that x-rays passing through body tissues on their way to a photographic plate would show bones, tooth decay, and metal objects such as bullets. In the United States x-rays were first used to find a bullet in a wounded leg.

The tremendous value of Roentgen's discovery was realized within his lifetime and he was awarded the first Nobel Prize in physics. He refused to patent his discovery or to receive financial rewards from it. This proved a noble gesture for he lived through World War I which was followed by inflation and great financial hardship in Germany. Roentgen died a poor man.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT II TERMINOLOGY RELATED TO RADIOLOGY

SCOPE OF UNIT:

The purpose of this unit is to provide the student with a basic working vocabulary of medical terminology and jargon that is frequently used in radiology departments. Basic terms are presented and studied first, followed by study of terms relating directly to procedures and equipment used in a radiology department.

INFORMATION TOPIC: X OR DEMONSTRATION:

SUFFIXES/PREFIXES/WORD ROOTS
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. List and define the three parts of a word.
2. Match prefixes to correct definitions.
3. Match suffixes to correct definitions.
4. Match word roots to correct definitions.
5. Match medical terms to correct definitions.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. Instructor-made prefix, suffix, and word root flash cards

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

Gurley, LaVerne T. and William Callaway. Introduction to Radiologic Technology. St. Louis: C.V. Mosby Publishing Company, 1985.

Ballinger, Phillip W. Merrill's Atlas of Radiographic Positions and Radiologic Procedures. Vols. I-III, 6th ed. St. Louis: C.V. Mosby Company, 1986.

Frenay, Sr. Agnes. Understanding Medical Terminology. St. Louis: Catholic Health Association, 1985.

INTRODUCTION:

Medical terminology may or may not be new to you. In any case, you will become more comfortable with it as you continue to use terms on a regular basis. It is surprising to have people tell you to "speak English" when you are describing something using correct medical terminology. As usage becomes second nature to you, keep in mind that it will sound foreign to most people. Increasing your understanding of medical terminology will enable you to listen to conversations among physicians and technologists with a new understanding. It will be exciting, fun, and challenging.

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT II TERMINOLOGY RELATED TO RADIOLOGY

OUTLINE: (Key Points)

I. Parts of a word

A. Prefix - a word part placed at the beginning of a word

B. Suffix - a word part that is added (fixed) to the end of a word

C. Word root - the main part of a word, usually Latin or Greek, may or may not be a complete word

II. Prefixes

A. ab - away from; example: abduct

B. a/an - without, not; example: anuria

C. ad - toward; example: adduct

D. ante - before; example: antenatal

E. anti - against; example: antibiotic

F. bi - two; example: bilateral

G. epi - upon: example: epicondyle

H. retro - backward; example: retrograde

I. trans - across; example: translateral

J. pneumo - air; example: pneumothorax

III. Suffixes

A. cele - hernia, tumor; example: gastrocele

B. emia - blood; example: leukemia

C. itis - inflammation; example: arthritis

D. pathy - disease; example: myopathy

E. ectomy - to take out; example: tonsillectomy

F. osis - condition; example: psychosis

G. graph - image of; example; angiograph

IV. Word Roots

A. angio - vessel; example: angiogram

B. arth - bone joint; example: arthogram

C. cardi - heart; example: carditis

D. cerebro - brain; example: cerebrovascular

E. cholo - gallbladder; example: cholangiogram

F. cost - rib; example: costophrenic

G. cysto - sac, bladder; example: cystogram

H. gastro - stomach; example: gastroscope

V. Common Medical Terms

A. Antenatal - ante natal; prior to birth, prenatal

B. Anuria - an uria; without urine, no urine production

C. Arthropathy - arthro pathy; disease of a joint

D. Bilateral - bi lateral; to include both sides or both extremities

E. Carditis - card itis; inflammation of the heart

F. Cerebrovascular - cerebro vascular; vessels of the head or vessels of the brain

G. Cholecystogram - chole cysto gram; radiograph of the bile sac or gallbladder

H. Costophrenic - costo phrenic; area of chest where ribs and diaphragm meet

I. Cystogram - cysto gram; radiograph of the bladder

J. Gastrectomy - gastr ectomy; surgical removal of the stomach or part of stomach

K. Gastritis - gastr itis; inflammation of the stomach

L. Myopathy - myo pathy; disease involving muscles

M. Pneumogram - pneumo gram; radiograph demonstrating air

N. Pneumothorax - pneumo thorax; air within the thoracic cavity

O. Retrograde - retro grade; against or backward flow of fluid

VI. Summary and Conclusion

A. Parts of a word

B. Prefixes

C. Suffixes

D. Word roots

E. Common medical terms

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT II TERMINOLOGY RELATED TO RADIOLOGY

INTERACTION ITEMS:

1. What is the meaning of gastrectomy?
2. What is the meaning of carditis?
3. What is the meaning of cerebrovascular?
4. What is the meaning of costophrenic?
5. What is the meaning of anuria?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

1. Using instructor-made flash cards, conduct an in-class drill on prefixes, suffixes, and word roots presented in this lesson.
2. Have students generate their own medical terms by combining word roots and prefixes, word roots and suffixes, or words roots, prefixes, and suffixes. They can verify the existence of a newly generated words by checking a medical dictionary. It may be desirable to give the students additional word elements to work with.
3. Have students develop crossword puzzles using medical terms. Use standard graph paper.

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT II TERMINOLOGY RELATED TO RADIOLOGY

EVALUATION ITEMS

1. List and define the three parts of a word.

   a.

   b.

   c.

2. Match the following prefixes to their correct definitions.

_____	a.	ab	A.	across
_____	b.	ante	B.	toward
_____	c.	retro	C.	against
_____	d.	a/an	D.	backwards
_____	e.	bi	E.	upon
_____	f.	pneumo	F.	away from
_____	g.	ad	G.	two
_____	h.	anti	H.	not, without
_____	i.	trans	I.	before, prior to
_____	j.	epi	J.	air

3. Match the following suffixes to their correct definitions.

_____	a.	cele	A.	blood
_____	b.	itis	B.	disease
_____	c.	ectomy	C.	tumor, hernia
_____	d.	graph	D.	inflammation
_____	e.	osis	E.	picture, image
_____	f.	emia	F.	condition
_____	g.	pathy	G.	to surgically remove

4. Match the following word roots to their correct definitions.

_____	a.	gastro	A.	vessel
_____	b.	angio	B.	bladder or sac
_____	c.	cardi	C.	heart
_____	d.	arth	D.	gallbladder, pertaining to bile
_____	e.	cerebro	E.	rib
_____	f.	cholo	F.	bone joint
_____	g.	cost	G.	brain, or pertaining to the head
_____	h.	cysto	H.	stomach

5. Match the following medical terms to their correct definitions.

_____	a.	Gastritis	A.	disease involving muscles
_____	b.	Pneumogram	B.	against or backward flow of fluid
_____	c.	Myopathy	C.	radiograph demonstrating air
_____	d.	Retrograde	D.	prior to birth, prenatal
_____	e.	Cholecystogram	E.	inflammation of the stomach
_____	f.	Pneumothorax	F.	radiograph of the bile sac or gall bladder
_____	g.	Arthropathy	G.	to include both sides or both extremities
_____	h.	Cystogram	H.	disease of a joint
_____	i.	Bilateral	I.	air within the thoracic cavity
_____	j.	Antenatal	J.	radiograph of the bladder

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT II TERMINOLOGY RELATED TO RADIOLOGY

ANSWERS TO EVALUATION ITEMS

1. Parts of a word

   a. Prefix - a word part placed at the beginning of a word

   b. Suffix - a word part that is added (fixed) to the end of a word

   c. Word root - the main part of a word, usually Latin or Greek, may or may not be a complete word

2
   a. F
   b. I
   c. D
   d. H
   e. G
   f. J
   g. B
   h. C
   i. A
   j. E

3.
   a. C
   b. D
   c. G
   d. E
   e. F
   f. A
   g. B

4.
   a. H
   b. A
   c. C
   d. F
   e. G
   f. D
   g. E
   h. B

5.
   a. E
   b. C
   c. A
   d. B
   e. F
   f. I
   g. H

h. J
i. G
j. D

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LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT II TERMINOLOGY RELATED TO RADIOLOGY

SCOPE OF UNIT:

The purpose of this unit is to provide the student with a basic working vocabulary of medical terminology and jargon that is frequently used in radiology departments. Basic terms are presented and studied first, followed by study of terms relating directly to procedures and equipment used in a radiology department.

INFORMATION TOPIC: X OR DEMONSTRATION:

TERMS AND PROCEDURES USED IN RADIOLOGY
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. Match radiology terms to correct definitions.
2. Define radiology terms.
3. Match the titles of radiology workers to the correct descriptions.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. TM 1: Anatomical Position
2. TM 2: Posterior vs. Anterior
3. TM 3: Lateral - Medial
4. TM 4: Anterior-Posterior Projection
5. TM 5: Posterior-Anterior Projection
6. HO 1: Dictionary of Radiology Terms
7. HO 2: Anatomical Position and Related Terms

8. HO 3: Terms Related to Projection

9. HO 4: Dictation Report

10. Radiographs: Contact a local radiology department to obtain radiographs demonstrating the structures for each of the terms discussed in the section on radiologic procedures (i.e., cholangiogram, cholecystogram, colon, GI series, intravenous pyelogram, arteriogram, venogram). Radiographs may also be obtained from the Radiologic Technology Training Program, Penn Valley Community College, 3200 Pennsylvania, Kansas City, Missouri, 64111. Write for the cost of duplication film and processing.

12. Diagnostic reports or transcripts of dictation could be obtained from a local radiology department. For purposes of confidentiality, the patient's name should be omitted, or a ficticious name substituted.

INFORMATIONAL ASSIGNMENT: (Student)

HO 1: Dictionary of Radiology Terms

REFERENCES: (Instructor's Additional Information)

Ballinger, Phillip. Merrill's Atlas of Radiographic Positions and Radiologic Procedures. Vols. I-III, 6th ed. St. Louis: C.V. Mosby, 1986.

INTRODUCTION:

Terminology used to describe radiological procedures, positioning of patients, or equipment used in the department will seem awkward to deal with at first. As a student with a basic understanding of these terms, you will have a tremendous advantage, even on the first day in a radiology department. The advantage will be that you will be able to comprehend some of the special terms used. Once you start asking questions using the correct terminology, expect department staff members to become more interested in talking to you about radiology.

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT II TERMINOLOGY RELATED TO RADIOLOGY

OUTLINE: (Key Points)

I. Radiology Terms (HO 1)

INSTRUCTOR NOTE: Have students discuss abbreviations and terms contained in HO 1. Encourage them to practice pronouncing terms that are especially difficult.

II. Radiology Procedures

A. Cholangiogram - x-ray film of bile ducts following injection of contrast medium

B. Cholecystogram - x-ray examination of the gallbladder following the ingestion or injection of a contrast material

C. Lower Gastrointestinal Series (GI series) - series of x-rays of the large intestine using barium sulfate as the contrast medium

D. Upper Gastrointestinal Series (GI) - series of x-rays of the stomach and duodenum following the ingestion of barium sulfate

E. Intravenous pyelogram (IVP) - radiological procedure using injected contrast medium to study the shape and function of the kidneys

F. Arteriogram - a contrast medium is injected into an artery, usually through a catheter, to demonstrate an artery on the film

G. Venogram - a contrast medium is injected into a vein, usually of the leg, to demonstrate the veins on film

III. Terms Related to Positioning of Patient

A. Anatomical position - basis for radiology terms used to describe positions of the body for radiology procedures (HO 2)

1. Allows placement of the subject in a standard position so surfaces of the body can be named (TM 1)

2. Terms related to anatomical position

a. Anterior surface (ventral) - refers to the front of the body (TM 2)

b. Posterior surface (dorsal) - refers to the back of the body (TM 2)

c. Lateral - refers to the side of the body; also means away from the center of the body (TM 3)

d. Medial - refers to a part of the body that is close to or toward the midline of the body (TM 3)

B. Projection - the path of the x-ray beam (HO 3)

1. Anterior posterior (AP) projection (TM 4)

a. Patient faces x-ray tube

b. X-ray beam enters the front of the body and exits the back; x-rays travel from anterior to posterior

2. Posterior anterior (PA) projection (TM 5)

a. Patient faces away from x-ray tube

b. X-ray beam enters the back of the body and exits the front; x-rays travel from posterior to anterior

IV. Workers in Radiology

A. Radiologist - a physician who specializes in reading radiographs to assist in the diagnosis of patients in addition to performing the radiology procedures requiring the skills and knowledge of a doctor

B. Radiologic technologist - a health care professional who is a graduate of a certificate program or associate degree program in radiologic technology. Has the training and knowledge to position patients and manipulate technical equipment in order to produce radiographs needed for a diagnosis

C. Radiology aide - a health services assistant who has completed a course or has had on-the-job training in a radiology department

V. Summary and Conclusion

A. Radiology terms

B. Radiology procedures

C. Terms related to positioning of patient

D. Workers in radiology

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LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT II TERMINOLOGY RELATED TO RADIOLOGY

INTERACTION ITEMS:

1. What do the suffixes graph and gram mean?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

1. Read the dictation report (HO 4) aloud in class. Using a medical dictionary, look up the terms marked with an asterisk (*).

2. If other dictation reports or actual dictation tapes can be obtained for further practice, have students read the reports or listen to the tapes to further their familiarity with radiology terms.

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT II TERMINOLOGY RELATED TO RADIOLOGY

EVALUATION ITEMS

1. Match the following terms to the correct definitions

_____	a.	Upper GI series	A.	Study of an artery
_____	b.	IVP	B.	Study of the gallbladder
_____	c.	Choleangiogram	C.	Study of the vessels which carry bile
_____	d.	Cholecystogram	D.	Study of the stomach and small intestine
_____	e.	Arteriogram	E.	Study of the kidneys
_____	f.	Veinogram	F.	Study of a vein
_____	g.	Anterior	G.	The front of the body
_____	h.	Medial	H.	The side of the body or away from midline
_____	i.	Lateral	I.	The back of the body
_____	j.	Radiolucent	J.	The part of the body closest to the midline or middle of the body

2. Give a brief definition for any five of the following radiology terms.

a. Angiography

b. Cassette

c. Catheter

d. Cantrast medium

e. Density

f. Gamma radiation

g. Intensifying Screen

h. Opaque

i. Radiolucent

j. Tomography

3. Match the title of the worker in radiology to the correct description.

_____a. Radiology aide

_____b. Radiologist

_____c. Radiologic technologist

A. A health care professional who is a graduate of a certificate program or associate degree program

B. A physician who specializes in reading radiographs to assist in patient diagnosis in addition to performing the radiology procedures requiring the skills and knowledge of a doctor

C. A health services assistant who has completed a course or has had on-the-job training in a radiology department

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT II TERMINOLOGY RELATED TO RADIOLOGY

ANSWERS TO EVALUATION ITEMS

1. a. D
   b. E
   c. C
   d. B
   e. A
   f. F
   g. G
   h. J
   i. H

2. a. Angiography - the radiographic examination of the blood vascular system after the injection of an aqueous solution of contrast medium

   b. Cassette - a device for holding x-ray film during exposure, composed of two fluorescent intensifying screens in a metal and bakelite holder

   c. Catheter - a thin tube used for draining fluid from or introducing fluid into the body

   d. Contrast medium - a liquid substance introduced into the body which will not permit x-rays to penetrate it, and which is used to help visualize internal structures which otherwise are difficult to see

   e. Density - the degree of blackness on a radiograph

   f. Gamma radiation - radiation of short wavelength emitted by the nucleus of an atom following breakdown of the atom

   g. Intensifying Screen - screen composed of fluorescent material, usually calcium tungstate placed in close contact with an x-ray film to intensify the action of x-rays in radiography; reduces the amount of radiation to a fraction of what would otherwise be needed

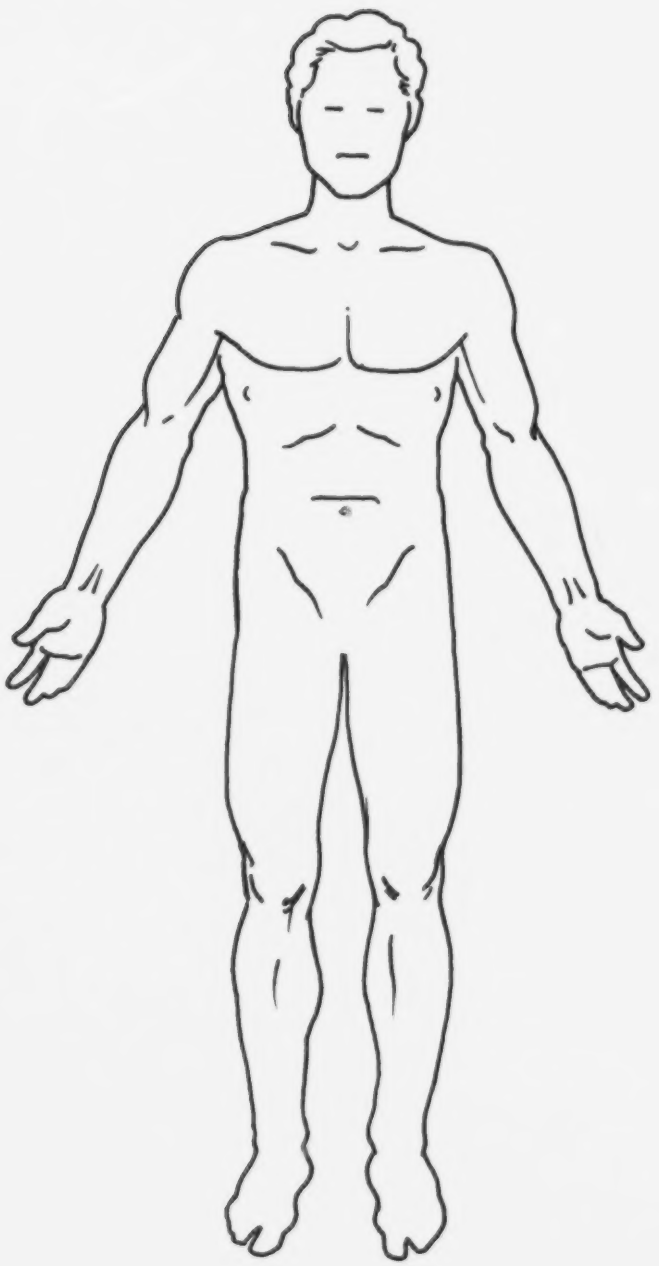
   h. Opaque - impenetrable by light or x-rays in the diagnostic quality range; opposite of radiolucent

   i. Radiolucent - the characteristic of materials which allow x-rays passing through them to produce dark images

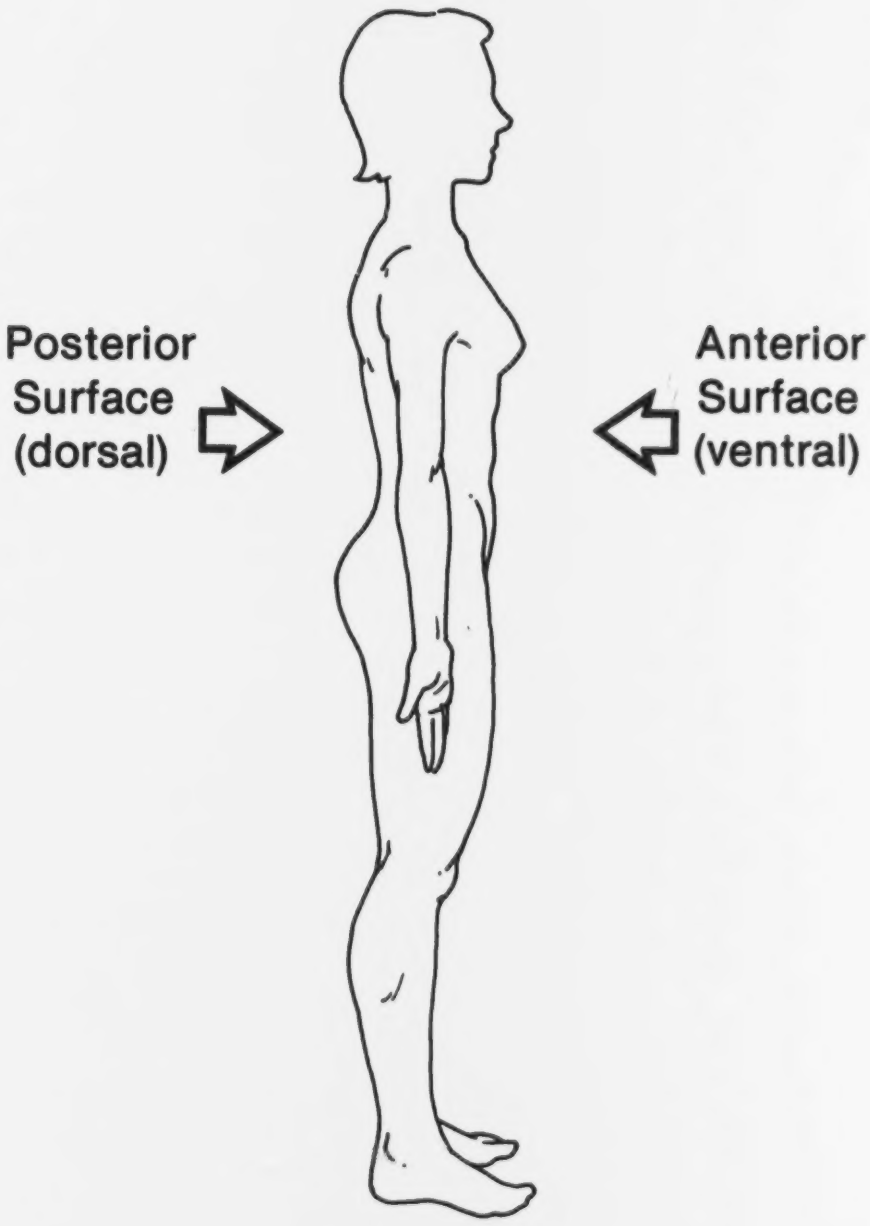
j. Tomography - special technique whereby a film representing a detailed cross-section of body tissue structure at a predetermined depth is produced

3. a. C
   b. B
   c. A

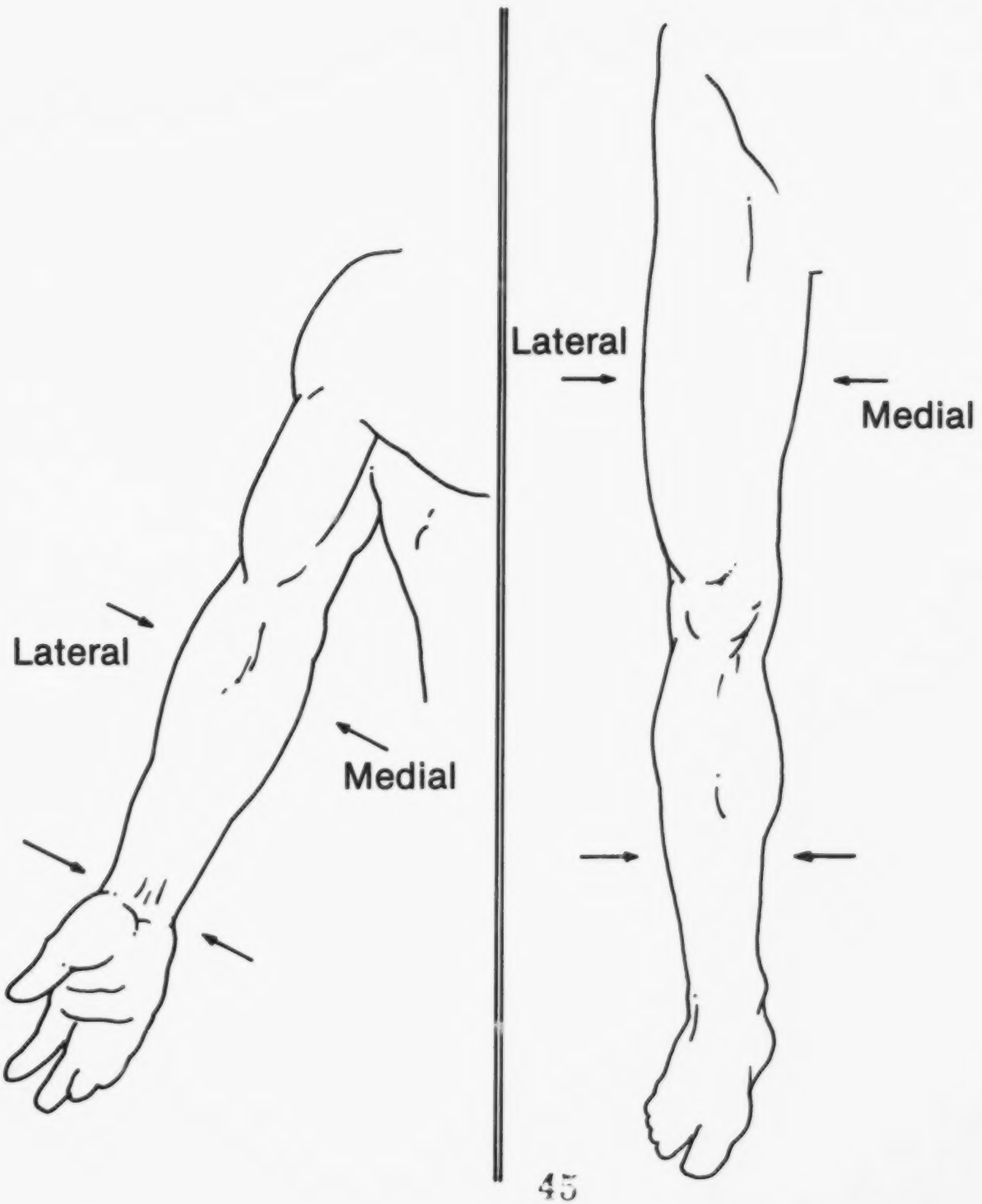
Anatomical Position



Posterior vs. Anterior



Lateral - Medial



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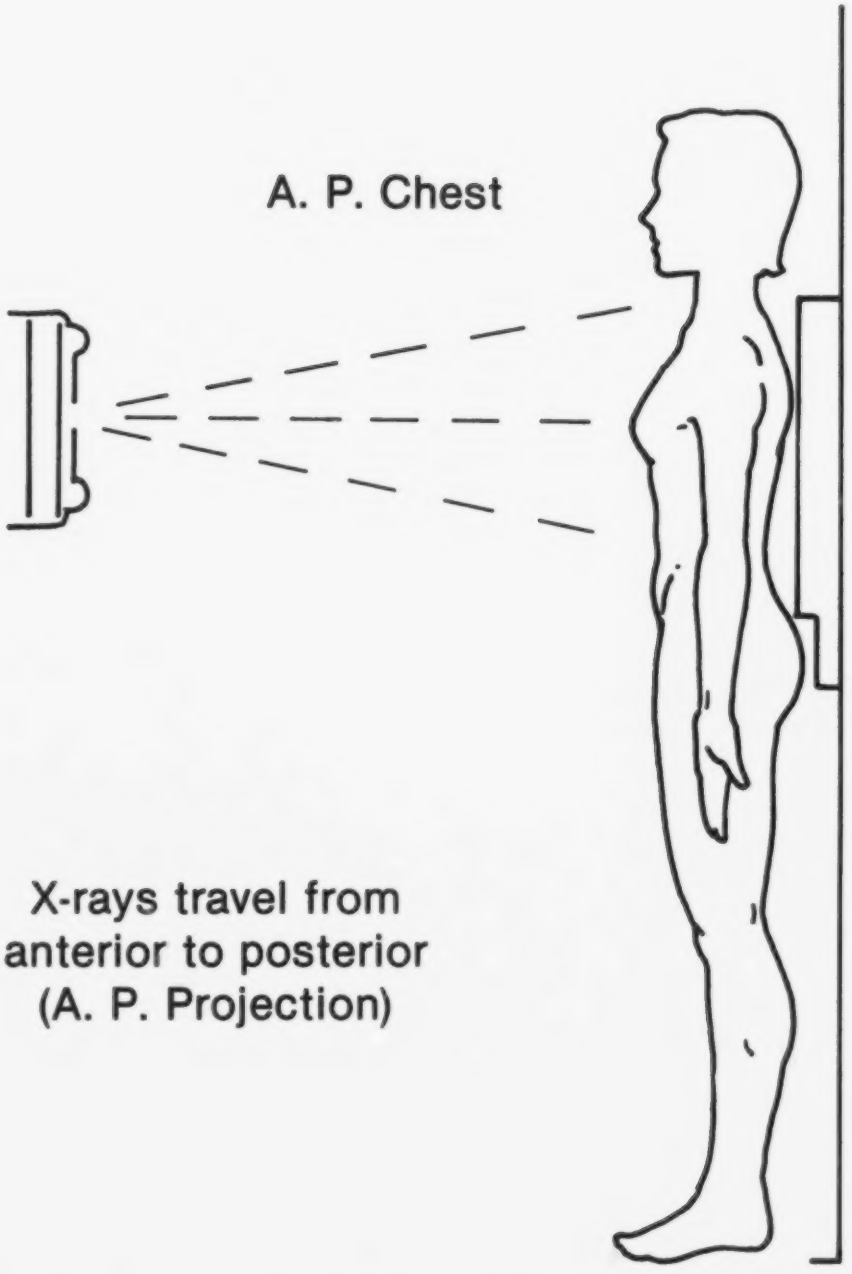
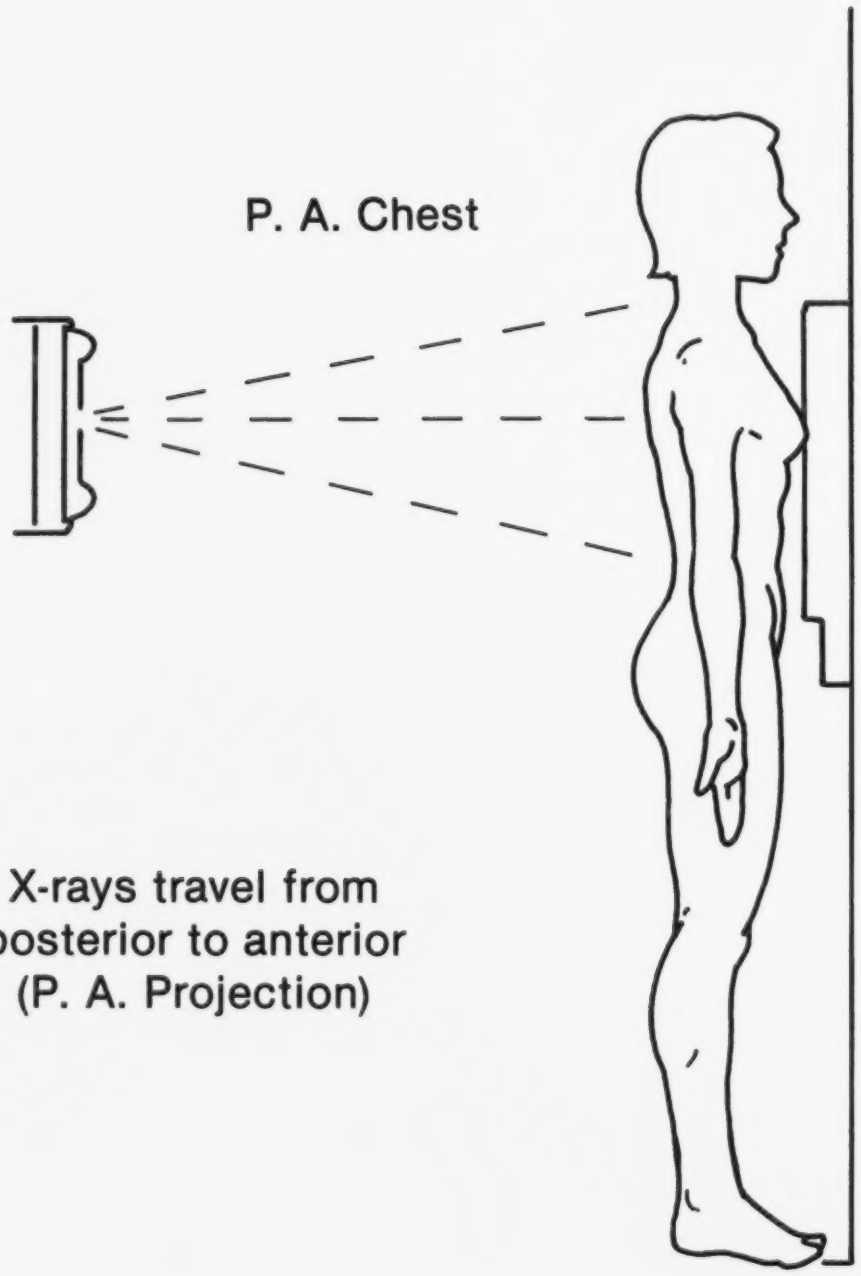
Anterior Posterior Projection



X-rays travel from
anterior to posterior
(A. P. Projection)

Posterior Anterior Projection



X-rays travel from
posterior to anterior
(P. A. Projection)

DICTIONARY OF RADIOLOGY TERMS

Abbreviations

AP: anterior posterior
CR: central ray
CT: computed tomography
DSA: digital subtraction angiography
FFD: focal-film distance; focus-film distance
FS: focal spot
GB: gallbladder
GI: gastrointestinal
IVP: intravenous pyelogram
kV: kilovoltage
LAO: left anterior oblique
Lat: lateral
LPO: left posterior oblique
mA: milliampere
mAs: milliampere second
OFD: object film distance
PA: posterior anterior
RAO: right anterior oblique
RPO: right posterior oblique
TFD: target film distance
UGI: upper gastrointestinal

Terms:

> **NOTE:** The suffixes "graph and gram" are frequently used at the end of terms for radiologic procedures; defintion of graph or gram is "diagram or image of"

ALPHA PARTICLE: A particle consisting of two protons and two neutrons which has broken away from an atom

ANODE: The positively-charged portion of a vacuum tube; in an x-ray tube, the anode contains the target which is bombarded by electrons during x-ray production

ANTERIOR: The front of the body; also called ventral

ANTERIOR POSTERIOR: The positioning of a part so that the central ray enters from the anterior aspect and emerges from the posterior aspect

ANGIOGRAPHY: The radiographic examination of the blood vascular system after the injection of an aqueous solution of contrast medium

ARTERIOGRAPHY: The radiographic examination of the arteries after the injection of a contrast material

ARTHROGRAPHY: The radiographic examination of a joint after injection of a contrast material

ARTIFACTS: Foreign or artificial marks on a radiograph which may be caused by static, dirty or damaged screens, loose foreign bodies in the cassette or on the film, or by objects left on a patient's body during exams

BARIUM: A metallic element; generally refers to barium sulfate, an insoluble compound of barium and sulfuric acid, which is used as a contrast medium in medical radiography because of its high radiopacity

BETA PARTICLE: An electron that is emitted from an atom at a high rate of speed; radioactive elements are beta emitters

BRONCHOGRAPHY: The radiographic examination of the bronchial tree using a liquid contrast medium

BUCKY: A bucky tray is part of the mechanism that holds the film cassette under the table top of the x-ray table; the bucky has a grid device which limits secondary radiation so that a film with a high quality image can be produced

CALCULUS: Any abnormal concentration of mineral salts within the body; commonly called stones

CASSETTE: A device for holding x-ray film during exposure, it is composed of two fluorescent intensifying screens in a metal and bakelite holder

CASSETTE CHANGER: A piece of radiographic equipment designed for quick changing of cassettes so that successive exposures may be made without changing the position of the patient

CATHETER: A thin tube used for draining fluid from or introducing fluid into the body

CATHODE: The negatively charged electrode of any vacuum tube; in the x-ray tube, the cathode contains the filament, which when heated, produces a cloud of electrons that are pushed across the tube to produce x-rays

CAUDAL: Toward the feet or the lower portion of the body

CHARACTERISTIC RADIATION: X-rays produced by interorbital shifts of electrons within an atom; characteristic in wavelength of the specific atom which produced them

CHOLANGIOGRAPHY: The radiographic examination of the biliary tract following intravenous injection of a contrast medium; it may be performed during or following surgery

CHOLECYSTOGRAPHY: A radiographic examination of the gallbladder following oral or intravenous administration of a contrast medium

CONE: A cone shaped device placed between the x-ray tube and the patient to reduce the size of the beam of primary radiation striking the part, thus reducing the amount of secondary radiation that is formed

CONTRAST MEDIUM: A liquid substance introduced into the body which will not permit x-rays to penetrate it; used to help visualize internal structures which otherwise are difficult to see

CYLINDER: A cylinder shaped device which may be used in place of a cone; a cylinder which may be extended is called an extension cylinder

DECUBITUS: A position for radiography in which the patient is lying down and the central ray is projected horizontally

DEFINITION: The degree of distinctness with which image details are recorded on the x-ray film; see DETAIL

DENSITY: The degree of blackness on a radiograph

DETAIL: The relative sharpness of the internal structures of a body as they are demonstrated on a radiograph; may be affected by density, contrast, and fog

DISTORTION: Difference in size and/or shape of the radiographic image as compared with that of the part examined

EMULSION: The x-ray-sensitive layer of the film that records the image

EXPOSURE: The process of subjecting a sensitive film to the action of x-rays

FILM: The medium on which the radiographic image is recorded

FLUOROSCOPIC UNIT: Radiographic equipment which consists of an x-ray tube and a fluorescent screen; X-rays are absorbed by the patient and the resulting shadows from the glow of the fluoroscopic screen are studied

FOG: A supplemental density that covers part or all of the film, obscuring image visualization; fog may occur as a result of exposing the film to secondary radiation, light, heat, chemical fumes or from using outdated film

GASTROINTESTINAL SERIES: A series of radiographs taken of the esophagus, stomach and duodenum following ingestion of barium; spot films of areas of importance are taken as the barium moves through the system

GAMMA RADIATION: Radiation of short wavelength emitted by the nucleus of an atom during a nuclear reaction

IMAGE INTENSIFICATION: An electronic system of producing fluorescent images by amplification of the brightness level so that they may be observed by means of a mirror-optical system; images are recorded by television camera or by a movie camera called a cine camera using a 105 mm film; digital fluoroscopy has the ability to store the image and reconstruct it for display with use of a computer

INTENSIFYING SCREEN: A screen composed of fluorescent material, usually calcium tungstate, placed in close contact with an x-ray film to intensify the action of x-rays in radiography; reduces the amount of radiation to a fraction of what would otherwise be needed

LATERAL: Refers to the side of the body, away from the midline; it could refer to a position that is turned 90 degrees from an AP or PA projection

LUMINESCENCE: The production of light by a crystal compound which is activated by an energy source (like x-ray)

MILLIAMPHERE-SECONDS: Term used to describe the exposure setting of an x-ray machine

MYELOGRAPHY: The radiographic examination of the spinal canal following the injection of a contrast medium

OBLIQUE: A position of the body that is turned or rotated from AP or PA between 1 and 89 degrees toward lateral

OPAQUE: Impenetrable by light or x-rays; opposite of nonopaque and radiolucent

OPAQUE MEDIUM: Contrast material introduced into a body cavity or structure to render it radiopaque

OVEREXPOSURE: The result of exposing an x-ray film to an excessive amount of x-rays

PRONE: A position for radiography in which the patient is lying face down

PASS BOX: A two-way, light-tight tunnel for passing exposed and unexposed film cassettes between the darkroom and exposure rooms

PHOTON: An individual electromagnetic ray; a bundle or packet of electromagnetic energy that travels at the speed of light

POSTERIOR: The back side of the body, also called dorsal side

POSTEVACUATION FILM: A film produced during a lower GI series of the large bowel made after the barium has been evacuated

RADIATION: The emission of energy, rays or waves

RADIOGRAPH: The record on a film which represents anatomical details of the part examined and which is formed by the differential absorption of x-rays or gamma rays

RADIOGRAPHER: A technologist who is trained and educated to produce radiographs

RADIOLOGIST: A physician specialist who uses all forms of radiation in the diagnosis and treatment of disease

RADIOLUCENT: The characteristic of material which allows x-rays passing through to produce black images

RADIOPAQUE: That characteristic of a material which does not allow x-rays or other radiant energy to pass through

RETROGRADE PYELOGRAM: The radiographic examination of the urinary tract in which contrast medium is injected into the kidneys through catheters which have been inserted into the ureters

SALPINGOGRAM: The radiographic examination of the fallopian tubes following injection of a contrast medium

SCOUT FILM: A preliminary or survey film of a body part, usually taken prior to the administration of opaque medium; also used to check the quality of the image

SCREEN: A device consisting of a rigid backing coated with fluorescent crystals; applicable to both a fluoroscopic screen and an intensifying screen

SECONDARY OR SCATTER RADIATION: X-rays that change in direction as a result of being deflected after collision with interposed material

SUPINE: A position for radiography in which the patient is lying face up

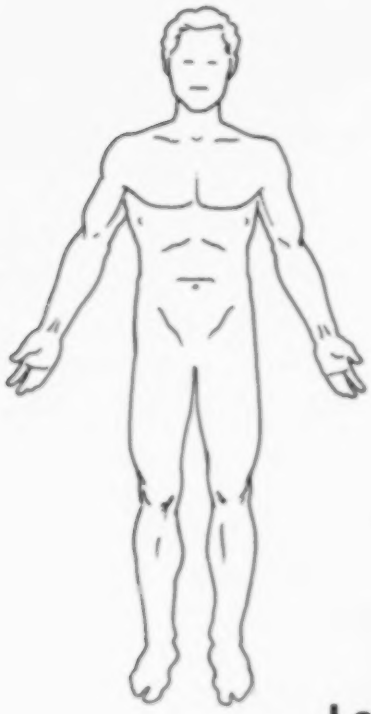
TOMOGRAPHY: Special technique whereby a film representing a detailed cross section of body tissue structure at a predetermined depth is produced; also termed body section radiography

VENOGRAM: The radiographic examination of venous structures following injection of a contrast solution into a vein

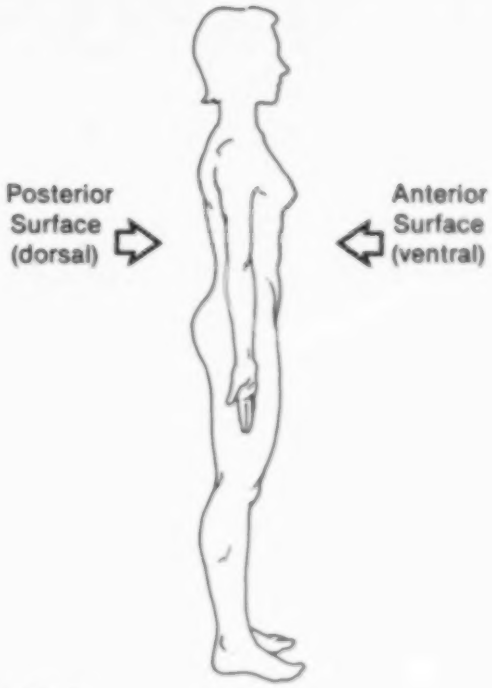
X-RAYS: Electromagnetic radiation possessing shorter wavelengths then light and produced when electrons traveling at high speeds strike matter

Anatomical Position and Related Terms

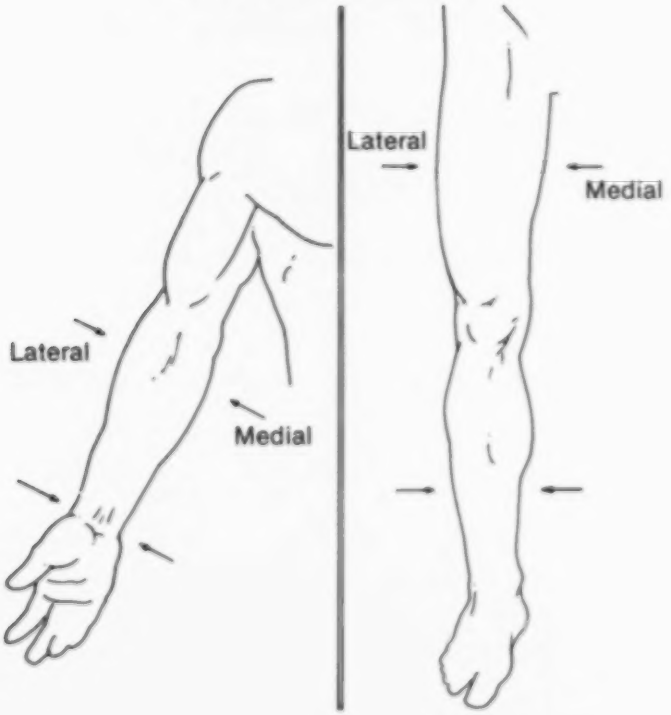
Anatomical Position



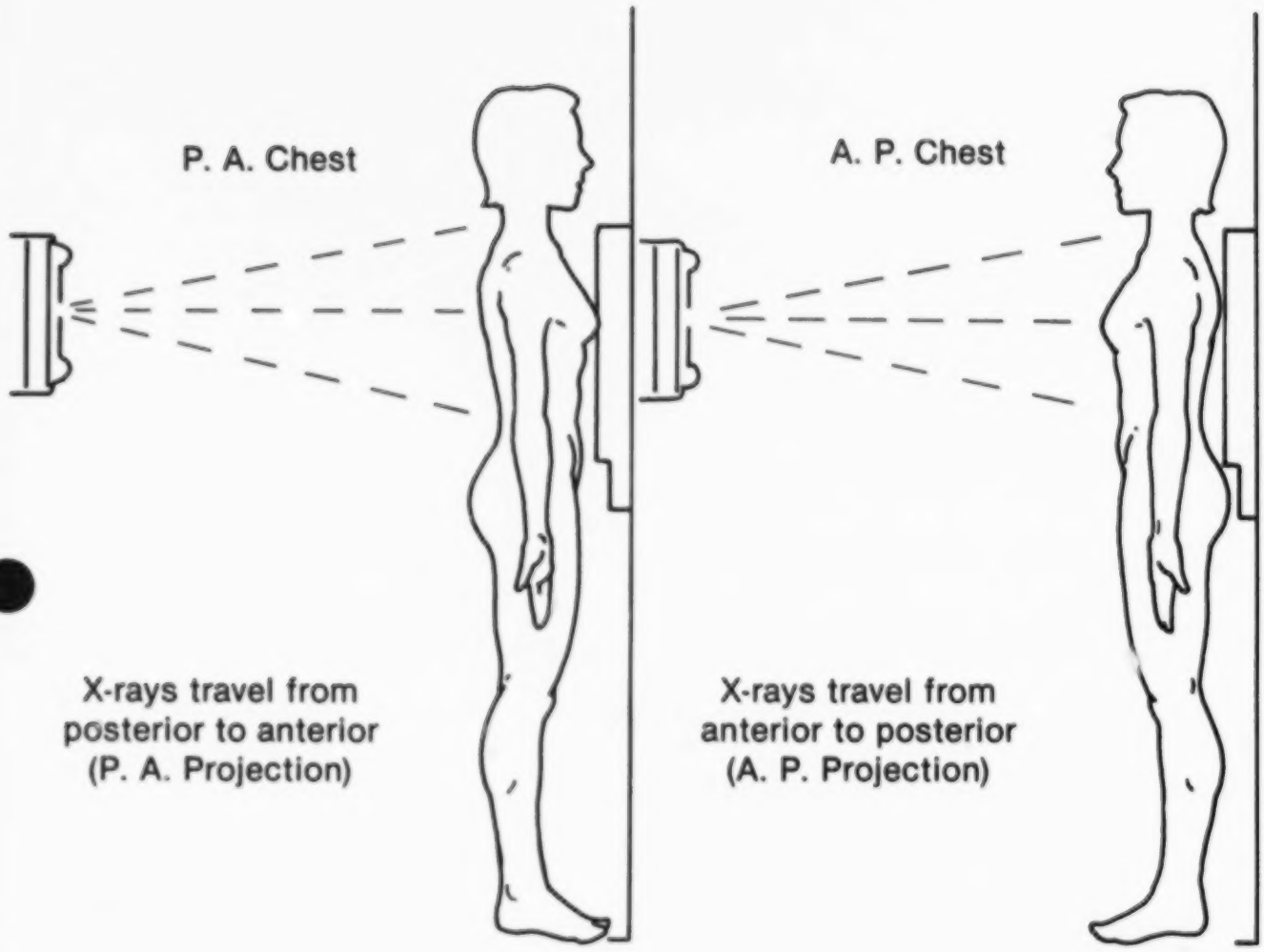
Posterior vs. Anterior



Lateral - Medial



Terms Related to Projection



Posterior Anterior Projection

Anterior Posterior Projection

DICTATION REPORT

Name: Yale, Mrs. Yvonne Room No. 557 Hosp. # 432678

Examination of: Upper G.I. Series X-ray # 5510

Attending Physician: Dr. X.R. Ray Date:

Preliminary scout films of the abdomen revealed a (*kyphoscoliosis) of the lumbar spine with moderate (*spondylosis deformans). The renal and psoas shadows appeared to be grossly within normal limits. The liver and spleen did not appear to be enlarged. The gas and bowel pattern appeared unremarkable.

With the patient in the erect position, barium was ingested under fluorscopic control and the swallowing mechanism appeared to be normal. There was evidence of an extremely large sliding type esophageal (*hiatal hernia) with evidence of (*reflux).

Barium flowed into the (*duodenal bulb) and there was no evidence of (*ulcer crater) or deformity. Off the medial aspect of the descending duodenum, there was noted to be a duodenal (*diverticulum).

The visualized portion of the small bowel appeared to be grossly within normal limits. On one aspect of the overhead films that included the lower aspects of the pelvis, there was noted to be a collection of barium just above the superior margin of the right obturator fossa which was suggestive of a right sided (*inguinal hernia). This should be correlated with clinical information.

IMPRESSION:

1. Sliding esophageal hiatal hernia with reflux.
2. Duodenal diverticulum.
3. Suggestive right sided inguinal hernia.

RADIOLOGIST'S SIGNATURE

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT III TELEPHONE TECHNIQUES

SCOPE OF UNIT:

This unit introduces the concept of correct telephone use in the place of business. There are some special rules that apply to telephone use in a professional or business environment that must be learned and followed.

INFORMATION TOPIC: X OR DEMONSTRATION:

BASIC TELEPHONE TECHNIQUES
(Lesson Title)

LESSON OBJECTIVES- THE STUDENT WILL BE ABLE TO:

1. List two criteria for answering incoming telephone calls.
2. List three steps in taking a phone message.
3. Identify the proper method of terminating a telephone conversation.
4. Identify ineffective telephone techniques.
5. Identify effective telephone techniques.
6. Given two hypothetical situations, describe how the radiology aide would respond correctly and professionally to each.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. HO 1: Telephone Techniques for the Health Professional

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

INTRODUCTION:

A person who is trained in proper use of the telephone can have a positive effect on building a professional atmosphere in the place of work. The telephone conversation may be the only contact with the caller. Over the telephone, we do not have the advantage that we have in person when we are able to smile, use friendly gestures, and offer a warm handshake. On the phone, we must make up the difference with our voice and how well we come across to the caller. Remember, the person calling cannot see you and can only judge you and your place of employment through the all-important telephone conversation.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT III TELEPHONE TECHNIQUES

OUTLINE: (Key Points)

I. Criteria for Answering Telephone Calls (HO 1)

A. Answer the phone on the first ring, if possible.

B. Identify the department or office by name.

C. Identify yourself by your first and last name.

D. Follow up with an appropriate phrase like "How may I help you?"

E. Find a pencil and piece of paper as you are starting the conversation and introducing yourself. "This is the _____ department; _____ speaking, may I help you?" By this time, you should have located a note pad and pencil or pen.

F. Display courtesy.

1. Use a natural and sincere manner of speaking.

2. Use a friendly tone of voice.

3. Develop the attitude of wanting to help other people. This positive attitude will come across on the phone.

4. Do not use standard phrases like, "Have a nice day," over and over again for every caller. Say something original that is appropriate to the person calling.

II. Taking a Telephone Message

A. Determine the purpose of the call by listening to the caller and asking questions for clarification.

B. Always obtain the caller's name and phone number if he/she is leaving a message or making an appointment.

C. Repeat the information contained in the message back to the caller to make sure it is accurate.

III. Termination of Telephone Calls

A. End the call in a sincere and agreeable manner.

B. Let the caller know that you were glad to be of service.

C. Try to allow the caller to hang up first.

IV. Effective Telephone Techniques

A. Answer promptly.

B. Be prepared to take notes.

C. Repeat the caller's name frequently.

D. Space outgoing calls to allow incoming calls to come through.

E. If you must put someone on hold, take the name and number of the second caller and return to the first caller, apologizing for the delay.

F. If it is necessary to leave the phone, tell the caller how long you will be gone. Upon returning, greet the caller by name again and apologize for any unavoidable delay.

G. Speak distinctly and unhurriedly.

V. Ineffective Telephone Techniques

A. Do not just say "Hello," state your department name and then your name followed by a statement like "May I help you?"

B. Do not say "Hold on for just a second," say, "I will need to put you on hold for a minute or two Mr./Mrs./Ms. _____, I will be right back."

C. Never provide patient information to anyone over the phone even if they say they are representing the patient. The only exception to this is if you know the person to whom you are speaking and they are privileged to have the information (i.e., the patient's doctor or doctor's nurse calls and wants an oral report).

D. Never contradict or argue with a caller.

E. Do not ever say no to an emergency, even though the caller may think it is an emergency and you may not think so. Meet the caller's needs.

F. Avoid losing your poise or becoming angry.

G. Do not discuss fees or charges over the phone, unless authorized to do so.

H. Do not say "The doctor is busy," say, "The doctor is with a patient and cannot come to the phone at this time. Is there anything that I may be able to do to help you?"

I. Never hang up on someone out of anger or frustration.

J. Avoid using slang words and phrases and giving casual responses.

1. "Okay." - instead say, "Yes, that is alright." or "Yes, I understand."

2. "Yeah." - instead say, "Yes."

3. "Ya know?" - instead say, "Do you know?" or "Do you understand?"

VI. Summary and Conclusion

A. Criteria for answering telephone calls

B. Taking a telephone message

C. Termination of telephone calls

D. Effective telephone techniques

E. Ineffective telephone techniques

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT III TELEPHONE TECHNIQUES

INTERACTION ITEMS:

1. Why is it important to smile and exhibit a positive and professional attitude just before answering the phone, no matter what is happening at the time?

2. What are some of the irritating things that people in a business have done when you spoke on the telephone to them for business purposes?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

1. Using two phones, role-play the following:

   a. An irritated caller wants to talk to the doctor and does not really want to be put off.

   b. An attorney or insurance agent has called, and is asking about the patient's diagnostic report and how many procedures were done.

   c. A patient calls asking you recommend the best doctor to go to for a particular problem.

   d. A person calls and wants to tell you at length about her/his illness and the many exams that she/he has had, and will be having and, and, and, and, etc.

   e. Someone calls asking for the cost of a procedure.

2. See if the class can come up with additional slang words or phrases to be avoided when processing a telephone call. Try to determine the correct, professional version of the same thing.

3. Practice answering the telephone, and see who sounds the most professional and positive. Students will be able to hear different styles and perhaps get the opinion of other students in class about how they sound on the phone and the effectiveness of the techniques that they use.

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT III TELEPHONE TECHNIQUES

EVALUATION ITEMS

1. List two criteria for answering the telephone in a business or professional setting.

   a.

   b.

2. State the three steps in taking a phone message.

   a.

   b.

   c.

3. How should you properly terminate a telephone conversation? (Circle the letter of the best answer.)

   a. Hang up on the caller before he/she has finished talking.

   b. Say "Good-bye" and hang up.

   c. Tell the caller that he/she should try to come in person next time since you do not have time to keep answering the phone.

   d. Let the caller know that you are interested in him/her as a person by saying, "Thank you Mr./Mrs./Ms. _____ for calling, if there is anything else that I can help you with in the future, please let me know." Then wait for the caller to hang up.

   e. Tell them you are sorry you cannot talk longer but you have to go now because you are busy. Thank them for calling and say, "Have a nice day."

The following statements are examples of telephone techniques. Place the letter "I" in the blank if the statement is an example of an ineffective telephone technique, or the letter "E" if it is an example of an effective telephone technique.

_____ 4. Wait until the phone rings at least twice before you answer it.

_____ 5. If someone has a message to give you, tell them to hold on until you can find a pencil or pen to write with.

_____ 6. If you are making several outgoing calls, space them several minutes apart so that people calling in will not keep getting a busy signal.

_____ 7. If you are too busy to talk, tell the person to call back later.

_____ 8. Repeat the caller's name, Mr./Mrs./Ms. _____, in the conversation.

Write a short answer to each of the following situations.

9. A patient's attorney calls and states that he/she is preparing for a hearing and is scheduled for court tomorrow. He/she needs the list of exams that were completed on his/her client the previous week. How would you respond to this request?

10. Someone calls and demands to talk to the doctor immediately. The doctor is with a patient. The caller is becoming increasingly irritated. How would you handle such a call?

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT III TELEPHONE TECHNIQUES

ANSWERS TO EVALUATION ITEMS

1. Any two of the following:

   a. Answer the phone on the first ring, if possible.
   b. Identify the department or office by name.
   c. Identify yourself by your first and last name.
   d. Follow up with an appropriate phrase like, "How may I help you?"
   e. Find a pencil and piece of paper as you are starting the conversation and introducing yourself. "This is the _____ department; _____ speaking, may I help you?" By this time, you should have located a note pad and pencil or pen.
   f. Display courtesy
      1. Use a natural and sincere manner of speaking.
      2. Use a friendly tone of voice.
      3. Develop the attitude of wanting to help other people. This positive attitude will come across on the phone.
      4. Do not use standard phrases like, "Have a nice day," over and over again for every caller. Say something original that is appropriate to the person calling.

2. a. Determine the purpose of the call by listening to the caller and asking questions for clarification.
   b. Always obtain the caller's name and phone number if he/she is leaving a message or making an appointment.
   c. Repeat the information contained in the message back to the caller to make sure it is accurate.

3. d
4. I
5. I
6. E
7. I
8. E

9. Answers will vary, but should point out that the confidential nature of such information does not allow the person answering the phone to discuss the patient's examinations over the phone. This would require the attorney to have a release form signed by the patient.

10. Answers will vary but should state that the correct way to handle this situation would be to calmly explain that the doctor is with a patient and cannot come to the phone, but would be able to return the call later. Take the caller's name and number, reading the information back for verification, then ask if there is anything else you can do to help.

TELEPHONE TECHNIQUES FOR THE HEALTH PROFESSIONAL

The health professional must have a thorough knowledge of how to use the telephone. Never underestimate the importance of projecting a positive, professional image through your telephone personality. Remember, the caller cannot see you, and can only judge you by how you sound over the phone. Your professional voice and good telephone manners are essential elements in making a good impression.

There is a great difference between telephone conversation and face to face conversation. The friendly smile, congenial personality and warm gestures are not as apparent when meeting by telephone. Positive voice to voice meetings are created by the natural and sincere manner in which you speak. Avoid overused words or repetitious phrases, which tend to give the impression of insincerity. It is essential to give prospective as well as regular patients the impression that they are receiving personal attention and individual consideration.

In your role as a receptionist, you have many opportunities to relieve your employer of details and protect his/her prestige. Your job is doubly important on the telephone because you are representing a business. An employer depends on the receptionist to intercept and screen calls, and in many cases, handle the call rather than interrupt a doctor or other practitioner. No matter what the situation, you should always be pleasant, tactful, and diplomatic.

THE THREE PARTS OF THE TELEPHONE CALL

1. Identification (introduction)

    a. Answer promptly, make the first impression a favorable one by answering on the first ring.
    b. Provide proper identification. Identify yourself and your place of work. It is important to let the caller know that he or she has reached the right person.
    c. Answer in the manner in which your employer wishes you to - - usually by saying, "This is the _____ department; _____ speaking, may I help you?"
    d. Do not answer with a number of an extension (i.e. "This is extension 671.").
    e. Establish a courteous and friendly attitude.
    f. Be prepared to take written messages by having a pencil and note pad available.

2. Body of the call (purpose)

    a. This is the reason for the call, such as to make arrangements or plans, or to find out specific information.

b. Always obtain the caller's name and telephone number.
c. If the caller is a new client/patient, ask who referred him/her.
d. Never use the term "cancellation." It has a negative and harsh sound. Instead of "We have a cancellation," say, "We can get you in at."
e. When taking a message, be accurate. Repeat the information to the caller to assure him/her that you have the correct information.
f. If the caller is a new client/patient, obtain address, phone number of home and business, and the correct spelling of his/her name.

3. Termination (conclusion)

a. End the call in a sincere and agreeable manner.
b. Let the caller know you were glad to be of service.
c. Let the caller hang up first.

HOLDING THE TELEPHONE

1. Hold the telephone mouthpiece one-half to one inch away from your lips. Your voice is carried more clearly by the telephone if you hold the transmitter close to your mouth and if you speak directly into the phone. A good rule is: if two fingers are placed against the mouthpiece and your lips against the fingers, even a hearing impaired person will be able to hear due to the vibrations of the transmitter. It is never necessary to shout into the telephone.

2. Never have anything in your mouth. Do not chew on a pencil or gum and avoid smoking when you are talking on a telephone.

INEFFECTIVE TELEPHONE TECHNIQUES

1. Never say "hello" without also providing proper identification.
2. Never demand information, ask for information in a courteous manner.
3. Never give out information that may damage the employer's image.
4. Never contradict a patient directly (time and day of appointment).
5. Never discuss the habits or problems of one patient with another.
6. Never say no to an emergency.
7. Never use the term "okay" or other slang terms.
8. Never lose poise or become angry.
9. Never use the business phone for personal business.

EFFECTIVE TELEPHONE TECHNIQUES

1. Answer promptly.
2. Be prepared to take a message.
3. Be courteous even though the caller is discourteous.
4. Repeat the caller's name frequently. People like to hear their own name.
5. Space outgoing calls to allow incoming calls to come through.
6. Retain the initiative. Learn when and how to cut off long-winded patients tactfully.

7. If more than one line is ringing and you must ask the caller to hold, take the name and telephone number of the second caller as quickly as possible and return to the first caller, apologizing for the delay.
8. If necessary, have the patient's file containing history, x-rays and other information at hand. You will be prepared, and the call will be handled much more efficiently.
9. Screen calls in a businesslike manner.
10. If it is necessary to leave the phone be sure to tell the person on the phone how long you will be gone. Upon returning, greet them by name and if there was an unavoidable delay, apologize.
11. Speak distinctly and unhurriedly.

Remember, the most important part of a telephone call is the closing. Always end your conversations with a few pleasant words: "Thank you for calling, it's good to speak to you again," or "I'm so glad you called that to my attention." By learning and practicing these techniques, you will make the most of a few moments of personal contact between you and someone who needs your help. You will look, sound, and feel professional.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT IV RADIOLOGY DEPARTMENT RECORDS

SCOPE OF UNIT:

Radiology department records, like all medical records, are important legal and medical documents. This unit discusses the responsibilities of department staff in keeping records. It also covers the methods of keeping necessary records and film files for a radiology department.

INFORMATION TOPIC: X OR DEMONSTRATION:

THE VALUE OF RADIOLOGY RECORDS
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. Identify the immediate value of records in the radiology department.
2. State the purpose of the radiologist's report.
3. Identify the confidential nature of all radiology department records.
4. Name the owner of all patient records, including reports and radiographs.
5. State the length of time that radiographs and radiologists' reports of diagnosis must be kept.
6. State the requirements that must be met for a record to be allowed to be used in a court of law.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

Spirko, Sister Christina. Radiologic Records. Springfield, IL: Charles C. Thomas Publisher, 1974.

INTRODUCTION:

A record is a collection of data stored on a recording form or medium for future retrieval and use. Bits of important information accumulated during the course of everyday living should be stored and kept as a permanent record simply because we do not have the capacity to remember all of the information that we may need to make our lives easier and more efficient. Just think what it would be like to do without records in today's world. Where would you be without the telephone numbers of your friends written down in a reference booklet for later use? What would happen if you did not have a method of keeping track of the amount of time that you worked on a job? Records can be stored on paper, film, video tape, cassette tapes or magnetic disks for computer use. Records must meet four criteria to be useful to us. They must be: accurate, complete, legible, and stored so they can be easily found.

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT IV RADIOLOGY DEPARTMENT RECORDS

OUTLINE: (Key Points)

I. Value and Use of Records in the Radiology Department

A. Radiographs are a form of record that have immediate value in diagnosing or ruling out a condition or disease.

B. Follow-up radiographs may be ordered to check on the progress and effectiveness of a particular treatment.

C. Future value exists if a condition occurs or reoccurs in that previous films can be used as comparison images.

1. If a normal chest radiograph is available for a patient who now may have an enlarged heart, it could be easily detected by comparing the normal film to the current film.

2. Changes in the health of organs or tissues can also be studied over a period of time to determine the progression of a condition or disease.

II. Radiologist's Role and Responsibilities

A. The radiologist is a specialist to whom other physicians refer patients for examination and an opinion about the suspected condition.

B. The radiologist must provide the referring physician with an opinion concerning the radiologic diagnosis of the patient's condition.

1. The radiologist will dictate the diagnosis on tape and a medical secretary will transcribe the diagnosis into a printed report.

2. In some hospitals, the radiologist will type the diagnosis into a terminal keyboard located in the area where he/she is viewing the radiograph.

C. The printed report is signed by the radiologist and copies are provided for the following:

1. Referring physician

2. Medical records department of the hospital

3. Patient's permanent report file in the radiology department

III. Confidentiality of Records

A. Confidentiality means to keep private; to trust or have faith that information will be kept private.

B. The radiologist, technologist, radiology aide, and all of the radiology department staff have an obligation to keep all patient information confidential.

C. All patient records are considered confidential and should be kept private.

IV. Ownership of Records

A. All patient records, including the radiographs, are the property of the hospital or, in the case of a doctor's office, they are the property of the doctor.

B. Patients may obtain copies of their radiographs to use when transferring to another physician or to another hospital for care. (Normally, in these circumstances, the new physician will request that the radiology department send copies of all radiographs with the patient on his/her first visit or prior to the visit.)

V. Time Requirements for Storage of Records

A. All records, including radiographs, should be kept for seven years beyond the last date that the patient was examined in the radiology department.

B. Many hospitals will keep records longer by storing all images and reports on microfilm. This takes less space and, with current microfilm processors and readers, is becoming an acceptable way of storing records.

C. Exceptions exist for the seven year minimum requirement:

1. Children's records are kept until the child is of legal age; then the record is kept for one year beyond the year the minor attains legal age.

2. Rare, unusual, or educationally significant cases that could be used at a later date for teaching purposes

VI. Records as Legal Documents in a Court of Law

A. Types of cases using radiology records

1. Criminal

2. Insurance

3. Malpractice

4. Personal injury

5. Workman's compensation

B. Criteria to be met for records to be admissible in court

1. Relevant - refers to applicability to the question or problem the court is dealing with at the time

2. Material - the radiograph must show the area of the body in question (i.e. a fractured cervical spine)

3. Competent - the radiograph must be proven to be of the person it claims to be. The technologist or radiologist may be asked to attest to this fact.

C. There must be proof of identity on each radiograph. Markers and the patient's name must be clearly and permanently recorded on each image. Imprinting the patient's name and other identification onto each film prior to development is often a duty of the radiology aide.

VII. Summary and Conclusion

A. Value and use of records in the radiology department

B. Radiologist's role and responsibilities

C. Confideniality of records

D. Ownership of records

E. Time requirements for storage of records

F. Records as legal documents in a court of law

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT IV RADIOLOGY DEPARTMENT RECORDS

INTERACTION ITEMS:

1. What person has the ultimate responsibility of insuring that all records of patient examination are accurate, quality and permanent records?
2. What professions, beside the medical professions, practice rules of confidentiality when dealing with their client?
3. What are some of the possible errors that may be made when keeping patient records?
4. Who gets copies of the radiologist's report?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

1. Obtain a radiograph and find the patient identification information.
   a. Look for right and left markers.
   b. Look for patient's name and number.
   c. Determine what other information is printed on the film that would act as a record of the event that is a record of the examination. (The edge of the film may indicate the name of the manufacturer of the film or perhaps a cassette number will be visible.)

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT IV RADIOLOGY DEPARTMENT RECORDS

EVALUATION ITEMS

Directions: For each of the following, write "T" if the statement is true, or "F" if it is false.

_____ 1. Radiographs that are more than a year old are essentially useless, but should be stored anyway.

_____ 2. Radiographs are a form of record that have immediate value in ruling out or confirming the suspected condition or disease.

_____ 3. It is permissible for the aide to show a patient's record to an interested friend of the patient as long as the patient doesn't find out.

_____ 4. Patient records that are kept in a doctor's office or hospital are the property of the patient's attorney.

_____ 5. Children's records must be kept for one year after they reach legal age, assuming they have not had recent examinations.

_____ 6. All radiographs must be kept no longer than four years beyond the last date of patient examination.

_____ 7. All radiology records must be relevant, material, and competent to be admissible in a court of law as evidence.

_____ 8. The purpose of the radiologist's report is to provide the patient's family and friends with an up-to-date report of the patient's condition.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT IV RADIOLOGY DEPARTMENT RECORDS

ANSWERS TO EVALUATION ITEMS

1. F
2. T
3. F
4. F
5. T
6. F
7. T
8. F

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT IV RADIOLOGY DEPARTMENT RECORDS

SCOPE OF UNIT:

Radiology department records, like all medical records, are important legal and medical documents. This unit discusses the responsibilities of department staff in keeping records. It also covers the methods of keeping necessary records and film files for a radiology department.

INFORMATION TOPIC: OR DEMONSTRATION: X

METHODS OF KEEPING RECORDS
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. Complete a radiology department admission form according to the steps of procedure.
2. Complete a new index card according to the steps of procedure.
3. Prepare a flash card (film identification card) according to the steps of procedure.
4. Complete a radiologist's report form according to the steps of procedure.
5. Obtain film jacket and record examination data onto the jacket according to the steps of procedure.
6. Log the patient's examination information onto the daily log according to the steps of procedure.
7. Refile the index card and the film jacket according to the steps of procedure.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. HO 1: Sample of a Completed Hospital Admissions Form
2. HO 2: Blank Hospital Admissions Form
3. HO 3: Sample of a Completed Radiologist's Report Form
4. HO 4: Blank Radiologist's Report Form
5. HO 5: Sample of a Completed Index Card

6. HO 6: Blank Index Card
7. HO 7: Sample of a Completed Flash Card (Film Identification Card)
8. HO 8: Blank Flash Card (Film Identification Card)
9. HO 9: Sample of a Completed Film Jacket
10. HO 10: Blank Film Jacket
11. HO 11: Sample of a Completed Daily Log Sheet
12. HO 12: Blank Daily Log Sheet

INFORMATIONAL ASSIGNMENT: (STUDENT)

REFERENCES:

Spirko, Sister Christina. Radiologic Records. Springfield, IL: Charles C. Thomas Publisher, 1974.

INTRODUCTION:

In this lesson you will discover that paperwork is the key to the operation of the radiology department. Each form and record must be completed correctly, so the flow of work in the department will go smoothly and quickly. It is easy to make errors, especially if you take the attitude that paperwork is not important. Always attempt to pay close attention to detail, especially when completing records. It is faster to do it correctly the first time rather than to do it over a second time because of a careless error.

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT IV RADIOLOGY DEPARTMENT RECORDS

INSTRUCTOR NOTE: Indicate to the students that this simulation of a record keeping system may not be the same as that used in the radiology department in which they will receive clinical experience, but that it will be similar.

STEPS OF PROCEDURE:

1. Transfer required information from the sample hospital admissions form (HO 1, HO 2) or registration form that the patient has brought to the department onto the radiologist's report form. (HO 3, HO 4)

2. Ask the patient if he/she has ever had x-rays in this department before.

   a. If the patient states yes, locate the correct completed index card in the alphabetical file. (HO 5)

      NOTE: Insert a place-holding card in the place previously occupied by the index card you are pulling to speed up refiling.

   b. If the patient says no, check the index file anyway to make certain there is not a card. (Perhaps the patient has a previous record and has forgotten.)

   c. If no card exists for the patient, complete a new index file card. (HO 6)

3. Following the correct format, add the name of the exam that has been ordered to the index card.

4. Prepare flash card (film identification card) (HO 7) including name, age, date and patient number. (HO 8)

   NOTE: This will be used in the flash printer to put patient's identification on the film.

5. Complete radiologist's report form.

6. Obtain and/or prepare the patient's film jacket (HO 9) according to policy of the department. (HO 10)

   NOTE: Insert a place-holder in the place previously occupied by the film jacket you are pulling to speed up refiling.

7. Write the date and the exam to be completed on the film jacket.

8. Add the patient's number, name, address, doctor, exam or procedure and other needed information onto the daily log. (HO 11, HO 12)

   NOTE: The log will help you and others in the department to determine if a patient's exam has been completed that day. Later it will be used as a cross-reference in case an index card is lost or misfiled. This sheet will be stored in a book along with other daily log sheets for the month or year.

9. When the films have been diagnosed (read) by the radiologist, refile the film jacket into a temporary (3-day) file or into the permanent archives.

10. Refile the index card.

SUMMARY AND CONCLUSION:

Review steps of procedure.

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT IV RADIOLOGY DEPARTMENT RECORDS

INTERACTION ITEMS: (Review Items)

1. Why is it a good idea to ask the patient if he/she has had an x-ray examination in the department before?

2. What specific information is needed from the admissions form?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

1. Practice completing the following forms:

   a. Hospital Admissions form
   b. Radiologist's report form
   c. Index card
   d. Flash card (film I.D. card)
   e. Film jacket
   f. Daily log

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT IV RADIOLOGY DEPARTMENT RECORDS

EVALUATION ITEMS

METHODS OF KEEPING RECORDS

EQUIPMENT:

1. Hospital admissions form (HO 2) that has been filled out by the instructor
2. Radiologist's report form (HO 4)
3. Index card (HO 6)
4. Flash card (HO 8)
5. Film jacket (HO 10)
6. Daily log sheet (HO 12)

DID THE STUDENT:	YES	NO
1. Transfer required information from hospital admissions form to radiologist's report form.		
2. Determine if patient has had x-rays in that department before. a. Pull correct index file card if patient has previously recieved treament.		
b. Complete new card for the new patient if there is no index file card.		
3. Add the name of the exam that has been ordered to the index card.		
4. Prepare flash card (film identification card).		
5. Complete the radiologist's report form.		
6. Obtain/prepare film jacket.		
7. Add new exam information to film jacket.		
8. Add patient information to daily log.		
9. Refile index card and film jacket.		

The student has satisfactorily completed the procedure "METHODS OF KEEPING RECORDS" according to the steps outlined.

_____
INSTRUCTOR'S SIGNATURE
(VERIFYING SATISFACTORY
COMPLETION)

_____
DATE

Sample of a Completed Hospital Admissions Form

PATIENT NUMBER	SEX	MARITAL STATUS	REL. CODE	BIRTH DATE MO. DAY YR.	AGE	RACE CODE	INPATIENT NO.	ROOM NO.	ADMISSION DATE & HR. TIME	PATIENT CODE	REVENUE CODE
07-1065-1	M	M		01 01 48	37	01	857801	OR 3	3/29/85 14:20	→ 14	→

PATIENT'S LAST NAME	FIRST	INITIAL	PATIENT'S S.S.N.	PATIENT'S PHONE	EMPLOYER'S PHONE
Smith,	Noel	K	510-50-5453	833-2273	932-7671

PATIENT'S BOX, APT., ETC.	PATIENT'S STREET ADDRESS	PATIENT'S CITY AND STATE	ZIP CODE
	7789 W. 89TH STREET	Anywhere, MO.	99999

PATIENT'S EMPLOYER ☐ OR ☐ OTHER	EMPLOYER'S STREET ADDRESS	EMPLOYER'S CITY AND STATE	ZIP CODE

GUARANTOR'S LAST NAME	FIRST	INITIAL	RELATIONSHIP OF PATIENT TO GUARANTOR CODE	GUARANTOR'S PHONE	GUARANTOR'S S.S.N.
SAME					

GUARANTOR'S BOX, APT., ETC.	GUARANTOR'S STREET ADDRESS	GUARANTOR'S CITY AND STATE	ZIP CODE	EMPLOYER'S PHONE

GUARANTOR'S EMPLOYER ☐ OR ☐ OTHER	EMPLOYER'S STREET ADDRESS	EMPLOYER'S CITY AND STATE	ZIP CODE

MEDICARE CLAIM (Y/N)	MEDICARE NUMBER	MEDICARE SUBSCRIBER'S NAME AS IT APPEARS ON CARD	MEDICAID NO. AND STATE	EXPIRATION DATE

INSURANCE CO. NAME AND ADDRESS	CERTIFICATE NUMBER	GROUP NO.	GROUP ☐ INDIV. ☑	SUBSCRIBER
Blue Cross Blue Shield	0698-025-1	K6934		
INSURANCE CO. NAME AND ADDRESS	CERTIFICATE NUMBER	GROUP NO.	GROUP ☐ INDIV. ☐	SUBSCRIBER

PERSON TO BE NOTIFIED IN EMERGENCY	RELATIONSHIP TO PATIENT	ADDRESS AND TELEPHONE
Bessie Smith	Sister	932-7509

TIME OF INJURY - DATE	CRASH RELATED YES NO	PLACE OF OCCURRENCE OF INJURY	ATTENDING PHYSICIAN	NOTIFIED YES NO	ALLERGIES
:	☐ ☐		Jackson	☐ ☐	

NURSES NOTES	POLICE NOTIFIED YES NO	CORONER NOTIFIED YES NO	☐ AMBULATORY ☐ AMBULANCE ☐ WHEELCHAIR	☐ SELF ☐ RELATIVE ☐ OTHER	B/P	TEMP.	PULSE	RESP.
	☐ ☐	☐ ☐						

NURSE'S SIGNATURE

PHYSICIAN'S NOTES

Mass in RUQ of abdomen c episodes of B.P. changes, fainting bouts.

CURRENT MEDICATIONS	LAB RESULTS – URINE	
NONE	COLOR	ACETONE
	TRANSP.	OCC. BLOOD
	SPEC. GRAV.	BILIRUBIN
LABORATORY TESTS	PH	WBC/HPF
	ALB	RBC
	SUGAR	
	LAB RESULTS – BLOOD	
X-RAY	HB	GLUCOSE
CAT SCAN	HCT	BUN
K.U.B.	MCHC	NA
	WBC	K
	STABS	CL
PRESCRIBED TREATMENT	SEGS	CO_2
	LYMPHS	
	MONOS	
	EOS	AMYLASE
	BASOS	PLAT. CT.

ATTENDING PHYSICIAN'S SIGNATURE Jackson

CONDITION ON DISCHARGE: SATISFACTORY ☐ OTHER ☐ INSTRUCTION GIVEN ☐

STATEMENT TO PERMIT EMERGENCY SERVICE TREATMENT

I, _____, believing that I am suffering from a condition requiring immediate emergency medical service, hereby authorize Hometown Hospital and its medical staff to provide such medical care, diagnosis, and emergency treatment as may be deemed necessary and advisable by the physician on duty and/or such aides and assistants as he or she may select.

I understand that medicine is not an exact science and acknowledge that no guarantees have been given to me concerning the outcome of the emergency, diagnostic and treatment procedures to which I am hereby consenting.

I understand that the diagnosis and treatment to be provided are limited to emergency medical care and that it may be necessary for me to select another physician and obtain from him a more complete diagnosis of my condition and such additional treatment as he may prescribe.

SIGNATURE OF PATIENT OR AUTHORIZED PERSON	SIGNATURE OF WITNESS	DATE	DEPARTURE TIME-DATE
Neil Smith	Sandra James		: | |

☑ EMERGENCY SERVICE ☐ OUTPATIENT TREATMENT RECORD

FORM 2403 (6-83)

White:Chart - Yellow:Patient Services - Pink:Physician - Gold:Radiology

Used with permission: Speediset® Moore Business Forms, Inc., Kansas City, MO

Hospital Admissions Form

PATIENT NUMBER | SEX M OR F | MARITAL STATUS | REL. CODE | BIRTH DATE MO. DAY YR. | AGE | RACE CODE | INPATIENT NO. | ROOM NO. | ADMISSION DATE & HR. TIME | PATIENT CODE → 14 | REVENUE CODE →

PATIENT'S LAST NAME | FIRST | INITIAL | PATIENT'S S.S.N. | PATIENT'S PHONE | EMPLOYER'S PHONE

PATIENT'S BOX, APT, ETC. | PATIENT'S STREET ADDRESS | PATIENT'S CITY AND STATE | ZIP CODE

(IF) PT'S EMPLOYER ☐ OR (☐ OTHER) | EMPLOYER'S STREET ADDRESS | EMPLOYER'S CITY AND STATE | ZIP CODE

GUARANTOR'S LAST NAME | FIRST | INITIAL | RELATIONSHIP OF PATIENT TO GUARANTOR CODE | GUARANTOR'S PHONE | GUARANTOR'S S.S.N.

GUARANTOR'S BOX, APT., ETC. | GUARANTOR'S STREET ADDRESS | GUARANTOR'S CITY AND STATE | ZIP CODE | EMPLOYER'S PHONE

GUARANTOR'S EMPLOYER ☐ OR (☐ OTHER) | EMPLOYER'S STREET ADDRESS | EMPLOYER'S CITY AND STATE | ZIP CODE

PRIMARY (1) | MEDICARE NUMBER | MEDICARE SUBSCRIBER'S NAME AS IT APPEARS ON CARD | MEDICAID NO. AND STATE | EXPIRATION DATE

INSURANCE CO. NAME AND ADDRESS | CERTIFICATE NUMBER | GROUP NO | GROUP ☐ INDIV. ☐ | SUBSCRIBER

INSURANCE CO. NAME AND ADDRESS | CERTIFICATE NUMBER | GROUP NO. | GROUP ☐ INDIV. ☐ | SUBSCRIBER

PERSON TO BE NOTIFIED IN EMERGENCY | RELATIONSHIP TO PATIENT | ADDRESS AND TELEPHONE

TIME OF INJURY - DATE : | CALL RELATIVES YES ☐ NO ☐ | PLACE OF OCCURRENCE OF INJURY | ATTENDING PHYSICIAN | SKIN PRICK YES ☐ NO ☐ | ALLERGIES

NURSES NOTES | POLICE NOTIFIED YES ☐ NO ☐ | ACCOMPANIED BY DOCTOR YES ☐ NO ☐ | ☐ AMBULATORY ☐ AMBULANCE ☐ WHEELCHAIR | ☐ SELF ☐ RELATIVE ☐ OTHER | B/P | TEMP. | PULSE | RESP.

NURSE'S SIGNATURE

PHYSICIAN'S NOTES

CURRENT MEDICATIONS

LABORATORY TESTS

X-RAY

PRESCRIBED TREATMENT

LAB RESULTS – URINE

COLOR	ACETONE
TRANSP.	OCC. BLOOD
SPEC. GRAV.	BILIRUBIN
PH	WBC/HPF
ALB	RBC
SUGAR	

LAB RESULTS – BLOOD

HB	GLUCOSE
HCT	BUN
MCHC	NA
WBC	K
STABS	Cl
SEGS	CO_2
LYMPHS	
MONOS	
EOS	AMYLASE
BASOS	PLAT. CT.

EXAMINING PHYSICIAN'S SIGNATURE

CONDITION ON DISCHARGE: SATISFACTORY ☐ OTHER ☐ INSTRUCTION GIVEN ☐

STATEMENT TO PERMIT EMERGENCY SERVICE TREATMENT

I, believing that I am suffering from a condition requiring immediate emergency medical service, hereby authorize Hometown Hospital and its medical staff to provide such medical care, diagnosis, and emergency treatment as may be deemed necessary and advisable by the physician on duty and/or such aides and assistants as he or she may select.

I understand that medicine is not an exact science and acknowledge that no guarantees have been given to me concerning the outcome of the emergency, diagnostic and treatment procedures to which I am hereby consenting.

I understand that the diagnosis and treatment to be provided are limited to emergency medical care and that it may be necessary for me to select another physician and obtain from him a more complete diagnosis of my condition and such additional treatment as he may prescribe.

SIGNATURE OF PATIENT OR AUTHORIZED PERSON | SIGNATURE OF WITNESS | DATE | DEPARTURE TIME-DATE : | |

☐ EMERGENCY SERVICE ☐ OUTPATIENT TREATMENT RECORD

FORM 2403 (6-83)

White:Chart - Yellow:Patient Services - Pink:Physician - Gold:Radiology

Used with permission: Speediset® Moore Business Forms, Inc., Kansas City, MO

Sample of a Completed Radiologist's Report Form

Indication for each procedure is required before the examination will be performed.

PROCEDURE	INDICATION	DATE OF INJURY	X-RAY NO.	DATE OF EXAM	TIME
C.A.T. Scan	Mass in Right Upper Quadrant		857801	5-1-85	ARRIVED
KUB					STARTED
					COMPLETED
					RETURNED

PATIENT'S NAME	ROOM NO.	DATE OF BIRTH	AGE	SEX	HEIGHT	WEIGHT
Smith, Noel	OP	1-1-48	37	M	6'0"	198

WALK ☐ WHL-CHR ☐ CARRY ☐ CART ☐ PORTABLE ☐

PATIENT CONDITION IV ☐ CATHETER ☐ OXYGEN ☐ ISOLATION ☐ OTHER ☐

DATE OF EXAM	ORDERING PHYSICIAN	NURSE'S SIGNATURE
5-1-85	Jackson	

BC ☐ BILL ☐ HOLD ☐ PAID ☐

Smith, Noel K. — PATIENT NAME
07-1065-1 — CHART NUMBER
Age 37 — AGE
Dr. Jackson — REFERRING PHYSICIAN

RADIOLOGY CONSULTATION

HOSPITAL CHART

HO 4

Radiologist's Report Form

Indication for each procedure is required before the examination will be performed.

PROCEDURE	INDICATION	DATE OF INJURY	X-RAY NO.	DATE OF EXAM

TIME

ARRIVED

STARTED

COMPLETED

RETURNED

PATIENT'S NAME	ROOM NO.	DATE OF BIRTH	AGE	SEX	HEIGHT	WEIGHT

WALK ☐ WHL-CHR ☐ CARRY ☐
CART ☐ PORTABLE ☐

PATIENT CONDITION
IV ☐ CATHETER ☐ OXYGEN ☐
ISOLATION ☐ OTHER ☐

DATE OF EXAM	ORDERING PHYSICIAN	NURSE'S SIGNATURE

BC ☐ BILL ☐ HOLD ☐ PAID ☐

PATIENT NAME _____ OPER NUMBER _____

AGE _____ REFERRING PHYSICIAN _____

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RADIOLOGY CONSULTATION HOSPITAL CHART

Sample of a Completed Index Card

Smith, Noel K.
7789 W. 89th
Anywhere, U.S.A.
99999

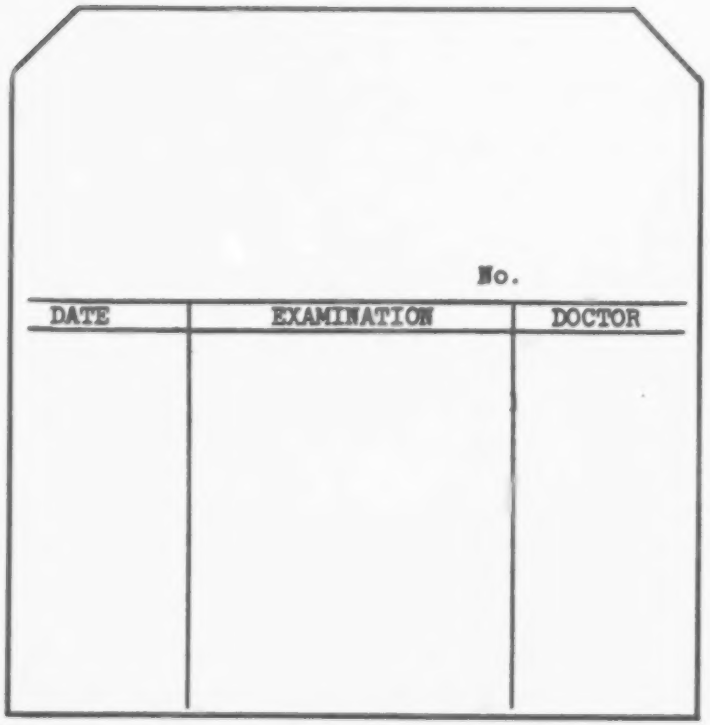
D.O.B.
01-01-48

No. 857801

DATE	EXAMINATION	DOCTOR
2-1-78	Chest	Jackson
3-5-82	L.Wrist, R.Elbow,skull	ER
11-21-82	R. Elbow	OP
5-8-83	Port. Chest	ICU-1
5-9-83	Port. Chest	Icu-1
7-4-83	abdomen	OP
5-1-85	C.A.T. Scan, KUB	OP

88

Index Card



Sample of a Completed Flash Card (Film Identification Card)

No. 857801 Age 37
Name Smith, Noel K.
Date 5-1-85

Flash Card
(Film Identification Card)

No._____ Age_____
Name_____
Date_____

Sample of a Completed Film Jacket

NUMBER	LAST NAME	FIRST NAME	INT.	AGE	YEAR
85 78 01	Smith,	Noel	K		

RADIOLOGY

DATE	TYPE OF EXAMINATION	READ BY	REMARKS
2-1-78	Chest		Normal
3-5-82	(L) Wrist, (R) Elbow, Skull		Fx Right Elbow - recheck films showing satisfactory alignment
11/21/82	Right Elbow		Healed Fx otherwise normal
5-8-83	Port Chest		Enlarged Heart, Possible CHF
5-9-83	Portable Chest		No change
7-1-83	Abdomen		Negative
5-1-85	C.A.T. SCAN, K.V.B.		Normal C.A.T. Scan, Normal Abdomen
	92		93

SIGN OUT ALL FILMS BEFORE REMOVING FROM RADIOLOGY DEPARTMENT

113

0
1

HO 9

Film Jacket

NUMBER

LAST NAME

AGE | FIRST NAME | INT. | YEAR

RADIOLOGY

DATE	TYPE OF EXAMINATION	READ BY	REMARKS
			93
	94		

SIGN OUT ALL FILMS BEFORE REMOVING FROM RADIOLOGY DEPARTMENT

0
1

HO 10

115

Sample of a Completed Daily Log Sheet

HOMETOWN HOSPITAL
"RADIOLOGY"
RECORD AND DISTRIBUTION OF CHARGES AND RECEIPTS
DATE 5/1/85 SHEET NO. 1 PREPARED BY C.O.

NUMBER OLD	NUMBER NEW	NAME	ADDRESS	DOCTOR	PART X RAYED	X RAY CHARGE		AGE	ROOM	TECH CHARGE	PROF CHARGE
857801	-	Smith, Noel K.	7789 W 89TH/Anywhere	Jackson	C.A.T. Scan, KUB	314	00			incl.	110.00

Daily Log Sheet

HOMETOWN HOSPITAL
"RADIOLOGY"
RECORD AND DISTRIBUTION OF CHARGES AND RECEIPTS

DATE_____ SHEET NO._____ PREPARED BY_____

NUMBER OLD	NUMBER NEW	NAME	ADDRESS	DOCTOR	PART X-RAYED	X-RAY CHARGE	AGE	ROOM	TECH CHARGE	PROF CHARGE

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT V DARKROOM PROCEDURE

SCOPE OF UNIT:

This unit will provide the student with the basic information needed to understand film processing. For diagnostic purposes, it is critical that x-ray images be of high quality. Processing the film is a very important step to formation of the image. Film, film holders (cassettes), and processing of the film will be discussed in this unit.

INFORMATION TOPIC: X OR DEMONSTRATION:

RAPID FILM PROCESSING
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. Match terms related to rapid film processing to correct definitions.
2. Identify the elements of rapid processing.
3. Identify the key points to each step in processing x-ray film.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. TM 1: Pass Box
2. HO 1: Automatic Processing
3. HO 2: Exposing Film to X-rays
4. HO 3: Removing Film from Cassette
5. HO 4: Flash Identification
6. HO 5: Loading Film into the Film Processor
7. HO 6: Film Bin

INFORMATIONAL ASSIGNMENT: (Student)

HO 1: Automatic Processing

The Fundamentals of Radiography, Kodak publication No. MI-18, Eastman Kodak Co. Chapter 9: "Film Storage and Handling" and Chapter 10: "Processing Radiographic Film"

REFERENCES: (Instructor's Additional Information)

E.I. DuPont De Nemours and Company Inc. Darkroom Technique. Publication Number E-18499, order from: E.I. DuPont De Nemours and Company Inc., 7415 Melvina Avenue, Niles, Illinois 60648.

Eastman Kodak Company. The Fundamentals of Radiography. Publication No. MI-18, order from: Eastman Kodak Company, Rochester, New York 14650. Cost - $5.00

INTRODUCTION:

Advanced technology has produced automatic machines designed for the radiology department such as the automatic processor of x-ray film. This has changed the quality of images produced by x-ray, ultrasound, and nuclear medicine. We now have quality control and standard image processing. Automatic processing compared to manual processing is a great improvement and it is important that we all understand how it works and how to use it properly.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT V DARKROOM PROCEDURE

OUTLINE: (Key Points)

I. Terms and Definitions

A. Radiopaque - a body structure that appears white on the radiograph; these structures absorb x-rays, not allowing them to get to the film.

B. Radiolucent - a body structure that appears black on the radiograph; these structures allow x-rays to pass through to the film

C. Latent image - the invisible image produced in the film emulsion by the action of light or x-radiation, which is converted to a visible or manifest image when the film is developed

D. Manifest image - the visible image which is produced by processing the film that has been exposed to an energy source

II. Steps in Rapid Film Processing (HO 1)

A. Film is exposed (HO 2) - x-rays transverse the body part causing a latent image to form on the film

B. Film is removed from cassette (HO 3)

1. Hands must be clean and dry (use of hand lotion should be avoided prior to handling film).

2. X-ray film is handled by the edges to keep from getting fingerprint marks on the film.

C. Patient's name is printed on film (flash identification) (HO 4)

1. Patient's name, identification number, and date of exam is typed on index card (flashcard). (See Unit IV, Lesson 2.)

2. Card is inserted into flash printer.

3. The appropriate corner of the film is inserted into the flash printer.

4. The printer automatically exposes the patient's name on the film.

D. Film is loaded into processor (HO 5)

1. Film is positioned on film tray so the least number of inches (lengthwise) pass through the processor.

2. Film sheet is positioned against the left or right edge of the entrance tray and then guided in along the edge of tray so the film does not turn crosswise during processing.

E. Film is arranged in film bin (HO 6) - storage box for unexposed film; film is placed in the film bin according to size, largest film sizes are placed in the front and smallest film is placed in the back.

F. Cassette is loaded - film from film bin is loaded into the appropriate cassette by touching only the edges of the film to avoid scratching the emulsion.

G. Pass box (TM 1)

1. This is a lead-lined, light-impermeable film cassette storage box set in the wall between the darkroom and the radiographic room.

2. Features interlocking doors that can be opened from only one side of the box at a time to prevent light from entering the darkroom.

3. Freshly loaded film cassettes are placed in order of size into "unexposed" compartment of pass box from the darkroom side. This helps avoid errors that may occur in a darkened room during an x-ray procedure, or during an emergency situation.

4. Exposed film cassettes are then loaded into "exposed" compartments of the pass box for processing.

III. Summary and Conclusion

A. Terms and definitions

B. Steps in rapid film processing

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT V DARKROOM PROCEDURE

INTERACTION ITEMS:

1. What is the main advantage of automatic processing?

2. Why is it advisable to feed narrow films into the processor in a side-by-side arrangement?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT V DARKROOM PROCEDURE

EVALUATION ITEMS

Match the following terms to correct definitions

_____	1. Manifest image	a.	A body structure that appears black on the radiograph; these structures allow x-rays to pass through to the film
_____	2. Latent image	b.	The visible image which is produced by processing the film that has been exposed to an energy source
_____	3. Radiopaque	c.	The invisible image produced in the film emulsion by the action of light or x-radiation, which is converted to a visible or manifest image when the film is developed
_____	4. Radiolucent	d.	A body structure that appears white on the radiograph; these structures absorb x-rays

5. Rapid processing involves the use of: (Circle the correct answer.)

a. Automatic film processor
b. Processor that will process a film in approximately three minutes or less
c. Darkroom equipped with an automatic processor
d. Machine that uses chemicals and heat for processing
e. All of the above

105

Match the description in column B with the corresponding term in column A.

A		B	
_____	6. Film exposure	a.	Holds unexposed and exposed film cassettes
_____	7. Film bin arrangement	b.	Film must be obtained from the film bin in the correct size to fit the cassette
_____	8. Loading the cassette	c.	The largest film is placed closest to the front with smaller sizes toward the back
_____	9. Pass box	d.	X-rays go through the body causing a latent image to be recorded on the film
_____	10. Printing the patient's name	e.	An index card is used to flash the patient's I.D. onto the film
_____	11. Loading the film into processor	f.	Film must be guided onto the tray using the side of the tray

If the statement is true place a "T" in the space provided. If the statement is false place an "F" in the space provided.

_____ 12. The patient's name is printed onto the film in the darkroom after the film is exposed but prior to development.

_____ 13. The pass box is a box placed in the wall between the darkroom and an adjacent radiographic room and allows a pass-through for cassettes.

_____ 14. X-ray film is resistant to scratches and can be handled without fear of scratching the emulsion.

_____ 15. Hand lotion can be used just prior to handling x-ray film because it is drying to hands.

_____ 16. Automatic film processors require that the film is first placed (by hand) into a developer solution, then a fixer solution, and finally into the water tank to rinse the film before placing it into the machine.

LESSON PLAN: 1

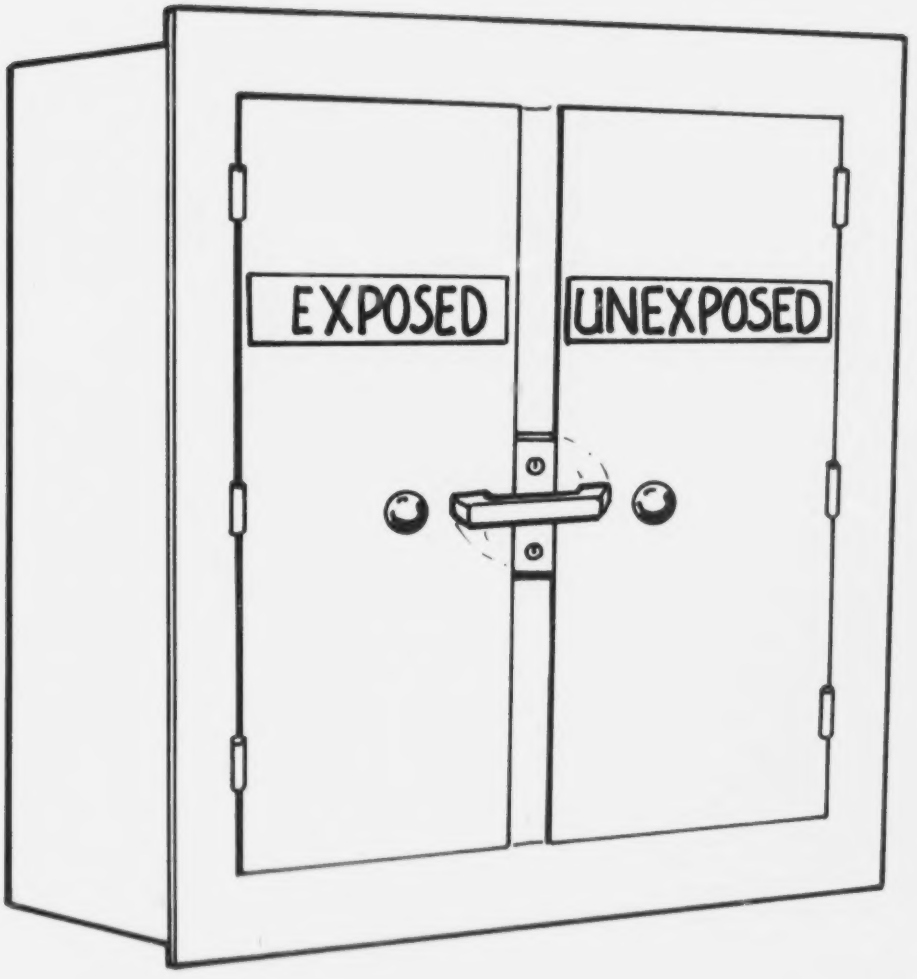
COURSE TITLE: RADIOLOGY AIDE

UNIT V DARKROOM PROCEDURE

ANSWERS TO EVALUATION ITEMS

1. b
2. c
3. d
4. a
5. e
6. d
7. c
8. b
9. a
10. e
11. f
12. T
13. T
14. F
15. F
16. F

Pass Box



AUTOMATIC PROCESSING

Many radiology departments are experiencing an increasing work load due to the growing popularity and use of x-ray technologies. Although computer-assisted image formation and storage has reduced the workload on the darkroom and the film processor, the need for automated, quality processing of x-ray film will continue to exist. Automatic processing is not simply the mechanization of hand processing, but a complex system of mechanics, chemicals, and film.

The time element in automatic processing is a major advantage. X-ray film is processed, dried, and a quality image produced, all within a period of three minutes or less. This rapid processing of the film requires that chemical solutions be pumped into the processing tanks in a quanity which is proportionate to the amount of film being processed.

Diagram A shows the parts of the automatic processor and the path of the film as it is transported through the machine. Film that is to be processed is loaded on the feed table or entrance tray. Once it is guided into the processor, the film is then transported by rollers through a succession of solution tanks (containing developer, fixer, wash) and then through the drying section.

A cycle diagram of a typical roller transport system automatic processor

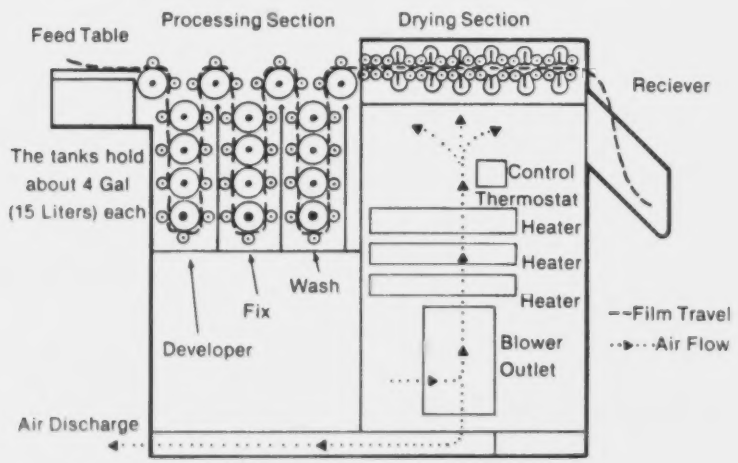


Diagram A: A typical roller transport system automatic processor

Diagram B shows the proper film feeding arrangements. The arrows indicate the direction in which films are fed into the processor. Films are fed one at a time into the processor using the edge or side of the loading tray as a guide. Narrower films should be fed side by side.

Roll film must be processed by first taping a sheet of film onto the leading edge of the roll of film and allowing the sheet film to act as a leader for the film. A special tape for this purpose is used in the darkroom area in hospitals that use roll film. A butt splice is used to prevent the adhesive side of the tape from being exposed.

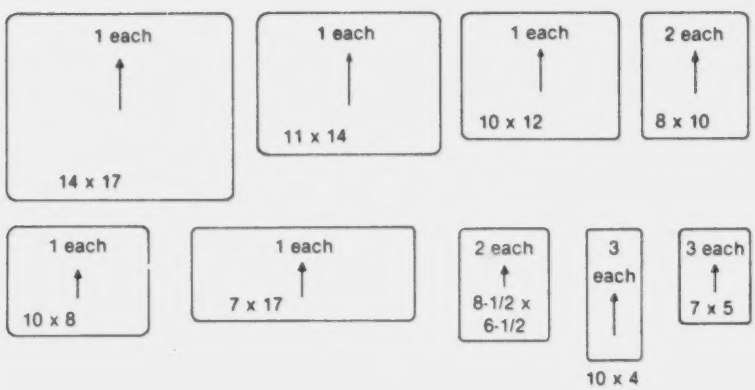
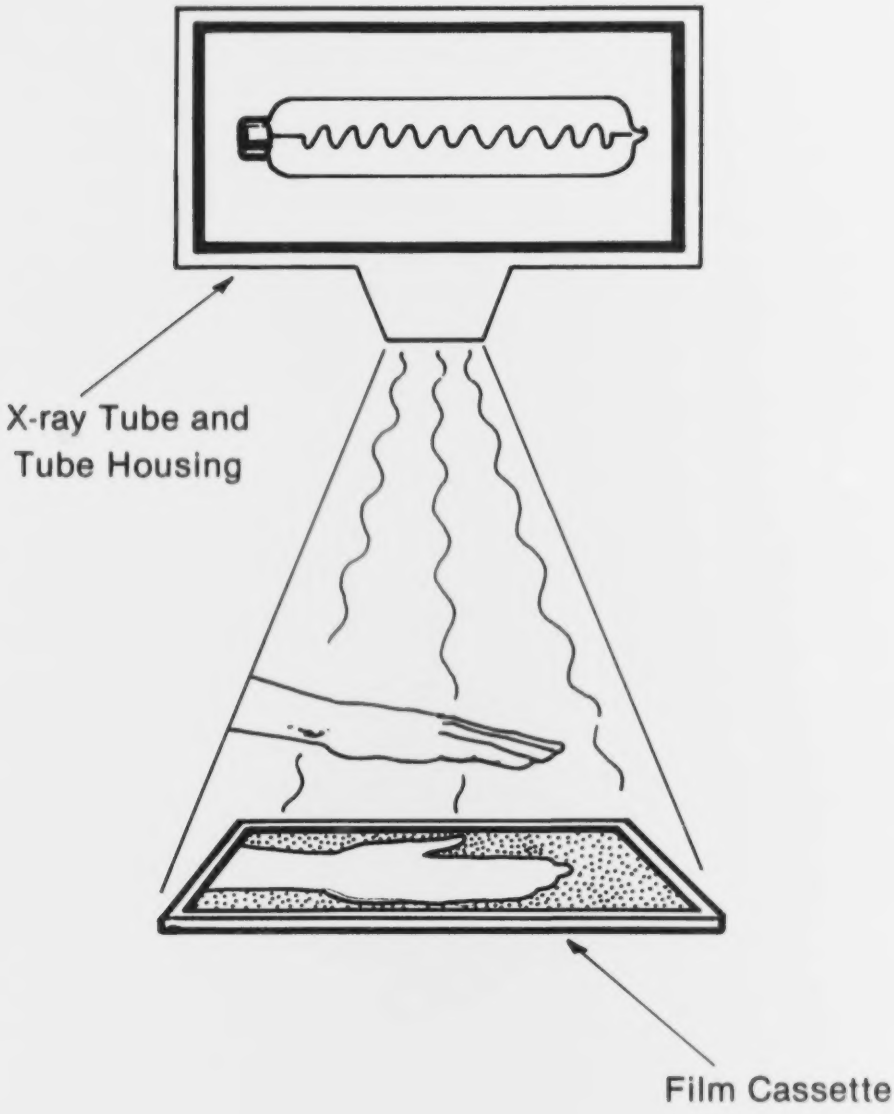
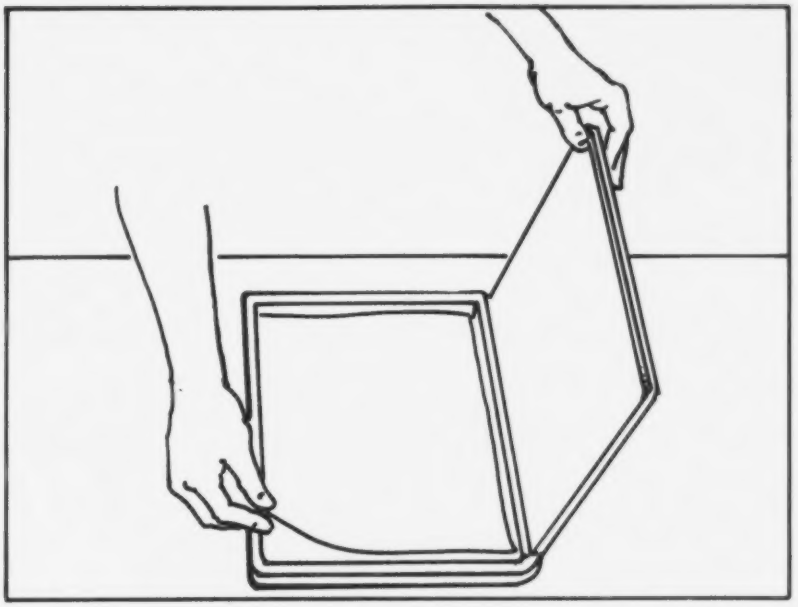


Diagram B: Film loading arrangements

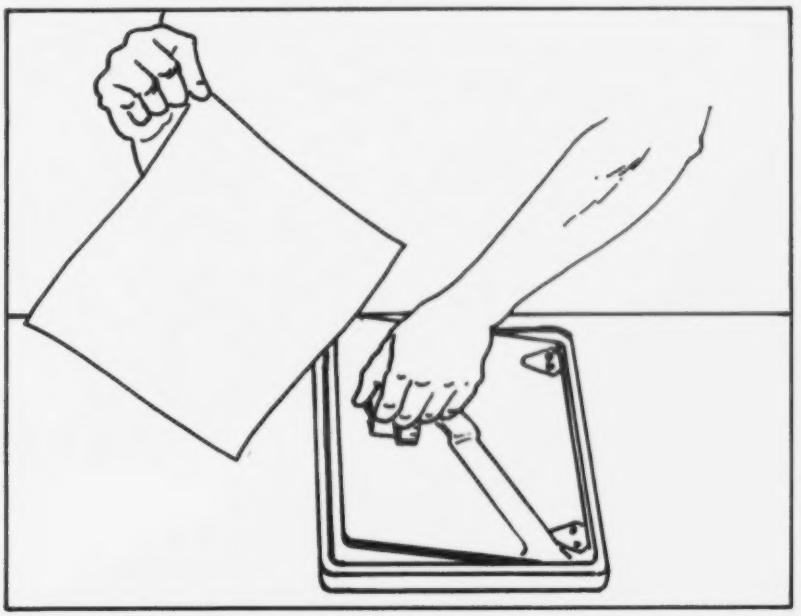
Exposing the Film to X-rays



Removing Film from the Cassette



A) Open and raise lid; grasp top corner of film with right forefinger and thumb.



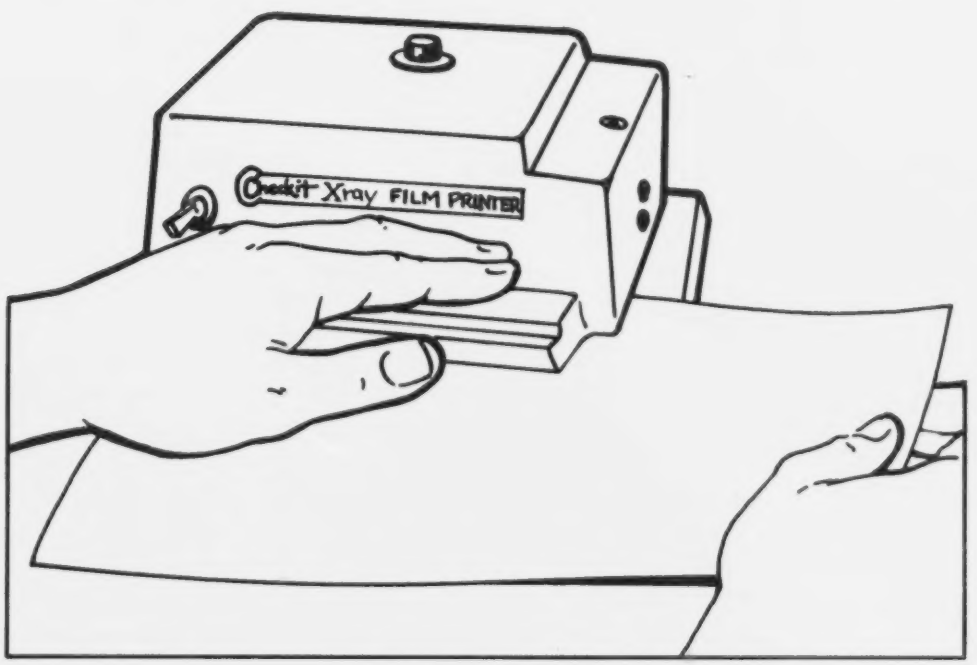
B) Lift film and hold it vertically while closing lid of cassette with left hand.

Handle all X-ray film by the edge of the film. (Always be sure to have clean, dry hands.

Flash Identification

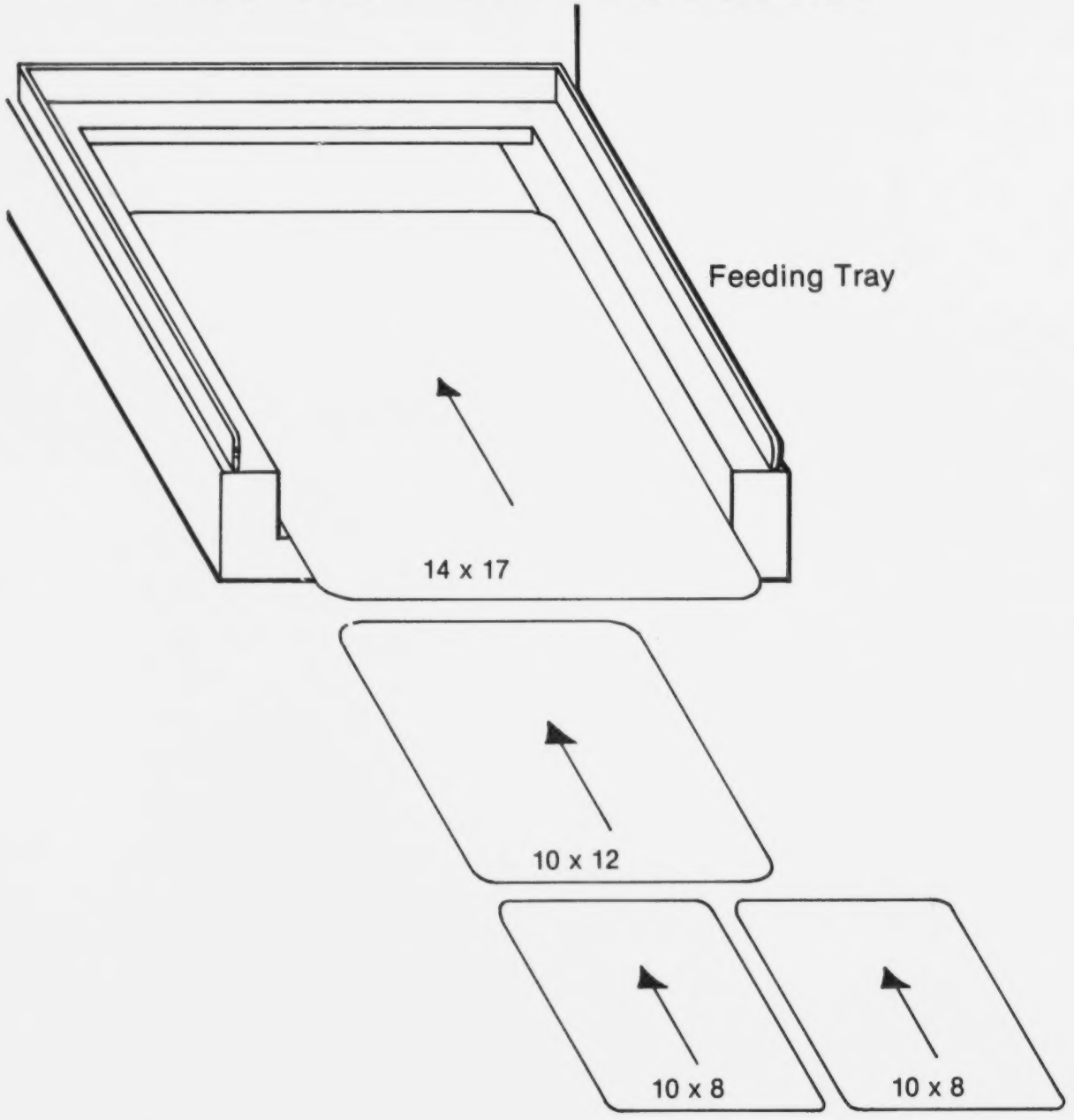
No. 857801 Age 37
Name Smith, Noel K.
Date 5-1-85

Flash card is inserted into the X-ray film printer prior to inserting the film.



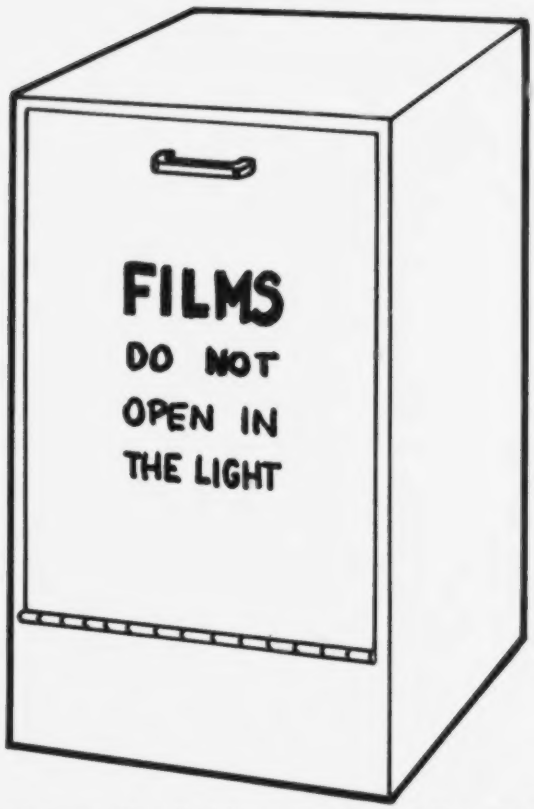
Film placed into the printer

Loading Film into the Film Processor



Place the sheet of film onto the loading tray exactly as shown above. Please notice how each sheet of film is placed onto the tray. Films are fed crosswise rather than lengthwise in order to reduce processing expense. Sheets of film must be guided in evenly. Use the edge of the tray as a guide to insure that film sheets are straight as they enter the processor.

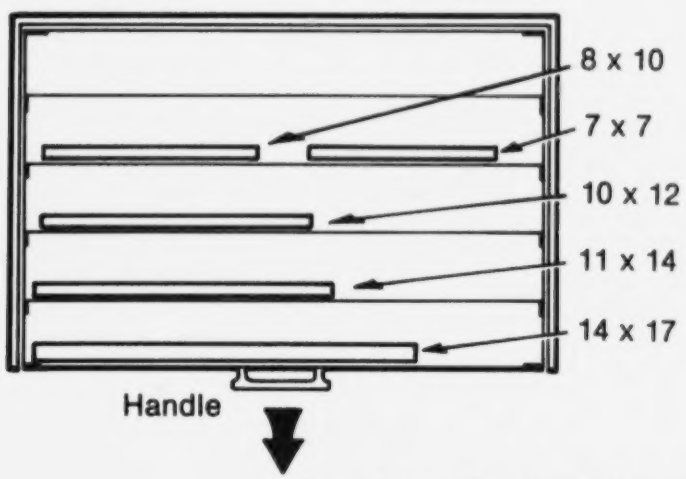
Film Bin



Open only when you are sure the lights are off and the darkroom door is closed and locked.

Arrangement of Film in Bin

Film boxes are organized by size.



Open by pulling toward you.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT VI RADIATION AND RADIATION SAFETY

SCOPE OF UNIT:

Students must understand the nature and characteristics of radiation in order to comprehend reasons for following rules of radiation safety. In this unit, students will be introduced to fundamentals of atomic structure, the nature of radiation, types of radiation, biological effects of radiation, and radiation safety.

INFORMATION TOPIC: X OR DEMONSTRATION:

THE NATURE AND CHARACTERISTICS OF RADIATION
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. Identify characteristics of the alpha particle.
2. Identify characteristics of the beta particle.
3. Identify characteristics of gamma radiation.
4. Describe how x-rays are produced.
5. Identify properties of radiation.
6. Identify the requirements for shielding the body from exposure to alpha particles, beta particles, gamma radiation and x-rays.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. Bureau of Radiological Health media presentations on radiation safety and radiation biology. Write for a catalog: FDA Publication 81-8023, Radiological Health and Training Resources Catalog, Bureau of Radiological Health, Rockville, Maryland 20857.
2. TM 1: Radiation Emitted from Atomic Disintegration
3. TM 2: Ability of Radiation to Penetrate
4. HO 1: Facts About Radiation

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

Hall, Eric J. Radiation and Life. 2nd ed. Elmsford, NY: Pergamon Press, Inc., 1985.

INTRODUCTION:

When the word "radiation" is mentioned it would be unusual to find a person who does not think immediately about the atomic bomb, death, and destruction. Unfortunately, radiation is a word with frightening implications. It would not be if people would understand that radiation is an integral part of our lives. We live with it; we have it in our homes, and it exists in our places of work and play. The sun, for example, is one of the most powerful and constant sources of radiation exposure that we have in our environment. The more you know about radiation the safer you will be in dealing with it in your everyday life. You must begin with an open mind and set about the task of learning the facts.

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT VI RADIATION AND RADIATION SAFETY

OUTLINE: (Key Points)

I. The Nature of Radiation

A. Radiation is energy

1. Any form of energy which travels in our environment in a wave pattern is considered to be radiant energy or "radiation."

2. Many types of radiant energy exist in the everyday world.

a. Sunlight

b. Soundwaves

c. Microwaves

d. Radio signals (AM, FM, short-wave, CB, etc.)

B. Types of radiation

1. Naturally-occurring radiation - when the nucleus of an atom becomes unstable, the atom disintegrates and three naturally-occurring types of radiation are emitted. (HO 1)

a. Alpha particle

(1) Particles that have broken away from an atom

(2) Made up of two protons and two neutrons

b. Beta particle

(1) Has broken away from an atom

(2) Consists of an electron traveling at a high rate of speed

c. Gamma radiation

(1) Energy that previously bound the disintegrated atomic particles together

(2) Small amounts of gamma radiation (background radiation) occur naturally in the environment. Most emissions come from brick, stone, and some types of concrete.

2. X-rays

a. Produced as electrons interact with atoms; not naturally-occurring

b. Methods of x-ray production

(1) Electrons are accelerated to a high rate of speed (near the speed of light) in an x-ray tube by causing electricity to flow through the tube.

(2) As they flow through the vacuum tube, the electrons decelerate suddenly as they approach an atom or crash into the target of the x-ray tube.

(3) This sudden deceleration and crashing of electrons flowing at a high rate of speed results in the production of x-rays.

II. Properties of Radiation

A. Radiation cannot be detected with any of the senses.

B. Radiation travels at or near the speed of light (186,000 miles/sec.).

C. Radiation will cause biological harm to cells exposed to large amounts.

D. Radiation is penetrating - it has the ability to travel through many types of materials.

E. Radiation will cause photographic film and x-ray film to be exposed, and upon development, will appear as a black area.

III. Protection from Radiation (TM 2)

A. Alpha - we can shield ourselves with a piece of paper; alpha particles do not travel very far due to their size

B. Beta - will travel several centimeters in most matter

C. Gamma - gamma and x-ray radiation will travel all the way through the body and some of the energy is absorbed by cells. The energy does NOT remain in the body. We can shield ourselves from x-ray and gamma rays with thick concrete or with lead.

1. Radiology departments are constructed with lead in the walls and the window glass in the control area.

2. Vinylclad lead aprons are also used.

IV. Summary and Conclusion

A. The nature of radiation

B. Properties of radiation

C. Protection from radiation

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LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT VI RADIATION AND RADIATION SAFETY

INTERACTION ITEMS:

1. What does the phrase "somatic effects" mean?

2. What were the high-risk groups identified in the 1920's and 30's as evidenced by their experiencing adverse reactions to exposure to large amounts of radiation?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT VI RADIATION AND RADIATION SAFETY

EVALUATION ITEMS

For each of the following, write "T" if the statement is true, or "F" if it is false.

_____ 1. Alpha particles are actually a combination of two neutrons and two protons.

_____ 2. Gamma radiation and x-rays are produced in the same way.

_____ 3. Beta radiation is manmade and is produced with the use of electricity.

_____ 4. Beta particles are high speed electrons.

_____ 5. We can shield ourselves from alpha particles with the use of a sheet of paper.

_____ 6. Gamma radiation and x-rays can penetrate all the way through the body.

_____ 7. X-rays will cause damage to human cells in proportion to the amount of x-rays the cells are exposed to.

_____ 8. We can effectively shield ourselves from x-rays and gamma radiation and use safety rules so that we are not in danger of being harmed from exposure to radiation.

_____ 9. X-rays cannot be detected or sensed but gamma can be felt as they go through the body.

_____ 10. The walls of the x-ray room and materials like window glass in the x-ray department are made of lead or have lead content.

11. Describe how x-rays are produced.

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

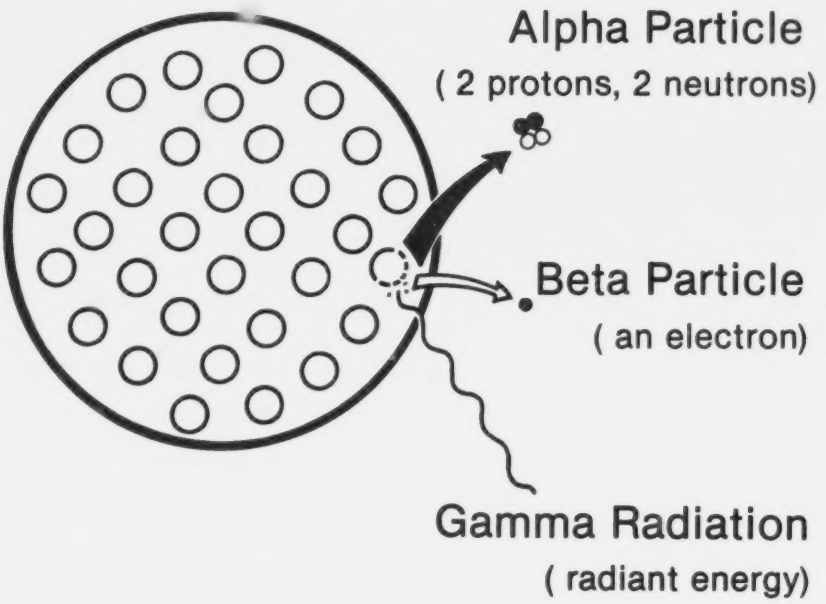
UNIT VI RADIATION AND RADIATION SAFETY

ANSWERS TO EVALUATION ITEMS

1. T
2. F
3. F
4. T
5. T
6. T
7. T
8. T
9. F
10. T

11. Electrons are accelerated to a high rate of speed (speed of light) in an x-ray tube by causing electricity to flow through the tube. As they flow through the vacuum tube, the electrons decelerate suddenly as they approach an atom or crash into the target of the x-ray tube. This sudden deceleration and crashing of electrons flowing at a high rate of speed results in the production of x-rays.

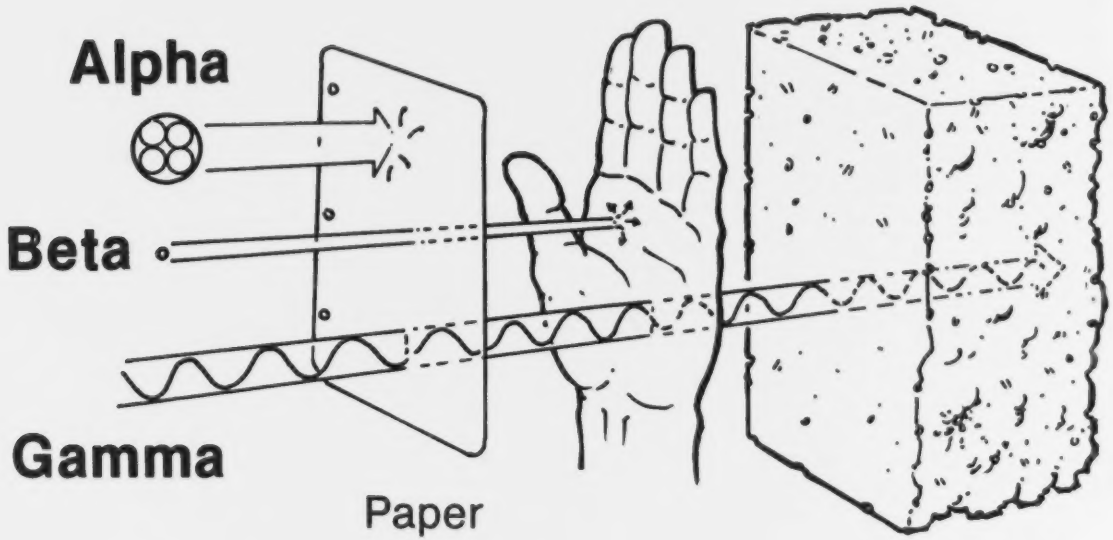
Radiation Emitted from Atomic Disintegration



When the nucleus of an atom becomes "unstable" as in this example of U-238 uranium, the atom disintegrates and three types of radiation are emitted.

1) Alpha particles
2) Beta particles
3) Gamma radiation

Ability of Radiation to Penetrate



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FACTS ABOUT RADIATION

The fact that radiation can produce biological damage has been known for many years. The first case of human injury was reported in the literature just a few months following Roentgen's original paper in 1895 announcing the discovery of x-rays. As early as 1902, the first case of x-ray induced cancer was reported in the literature. This early knowledge of the biological effects of radiation has helped motivate the development of new image technology which uses very small amounts of radiation as compared to amounts used in earlier years.

Evidence of harmful effects occurring as a result of exposure to large amounts of radiation existed in the 1920's and 30's. High-risk groups were identified as radiologists, miners exposed to airborne radioactivity while mining, persons working in the radium industry, and other special occupational groups. The long-term significance of smaller, cumulative doses of radiation, however, was not widely recognized until recently. Most of our current knowledge of the biological effects of radiation has been accumulated since World War II.

Somatic Effects of Radiation

Somatic effects are those biological effects which occur in all parts of the body except the gonads. (Reproductive organ exposure is considered to produce a potential "genetic effect" which will be addressed later in this handout.) Estimates of risk from exposure to radiation lack precision. Researchers are concerned with the biological effects of radiation and have a very good idea about how much radiation it takes to produce specific biological changes. Most biological harm occurs with much larger doses of radiation than would be received by the patient having an x-ray exam or by the technologist or aide who routinely observes safety precautions while working in the radiology department.

Here are some examples of documented correlations between exposure to radiation and associated somatic effects.

1. Twenty-five year follow-up studies of atomic bomb survivors show an increase in the occurrence of leukemia and cancer-related deaths, as compared to people not exposed to this high dose of radiation.

2. Use of radiation therapy for treatment of enlarged thymus glands in children has resulted in an increase in the occurrence of leukemia in those children treated with large doses of radiation.

3. Prenatal x-ray exposure is positively linked to an increased risk of leukemia.

4. Radiation sickness will occur if a dose of 450 rads (450,000 millirads) is received. Symptoms include nausea, vomiting, and diarrhea. Approximately 50 percent of the individuals exposed to this amount of radiation will die within 30 days and the remainder will recover.

The biological effects of radiation exposure are evident. No dose of radiation should be considered to be a safe dose. Exposure to radiation will be minimized by following safety rules and by using proper methods of handling x-ray equipment.

Factors that Determine Biological Harm

Rate of exposure:

If the amount of radiation that is to be used for treatment can be divided into smaller doses spread out over a longer period of time, the biological harm can be minimized. Patients receiving radiation therapy to treat a cancerous tumor are scheduled for several treatments with time interspersed between treatments so that the patient can recover. One dose of radiation at 1000 rads to kill a cancerous tumor would be much more damaging to healthy cells than ten doses of radiation at 100 rads each with one week between doses. Technologists receive extremely small doses and have comparatively long periods of time between doses if safe practice is used.

Area exposed:

Exposure of the entire body is much more damaging than exposure of a body part. Biological harm is proportional to the amount of body area that is exposed. The x-ray beam should thus be limited to the specific body part being examined. This reduces the biological effect to a fraction of that which would occur if the entire body were exposed. Radiology workers should always minimize the body area exposed by wearing vinylclad lead aprons. These are to be worn anytime the technologist, aide, or student is in the x-ray room while x-rays are being used.

Time of exposure:

The longer a person is in a room where radiation treatment is being used, the more the total radiation dose will be. Technologists, aides, and students should stay in the control booths while the x-rays are being taken. The only time that it should be necessary to be in the room is during a fluoroscopic procedure or occasionally with a very difficult patient. Lead aprons should always be worn during these times.

Distance from source:

The further away one stands from an x-ray source, the less the total radiation dose will be. If you must be in the x-ray room, it is wise to stand back as far as possible from the x-ray table. Doubling the distance that you place between yourself and the x-ray source cuts the amount of radiation that you receive to one-fourth.

Genetic Effects of Radiation

The germ cells (which are programmed to divide and form new cells) produced by the gonads (reproductive organs) are extremely sensitive to radiation exposure. In humans, these germ cells are present as sperm produced in the testes of males and ova produced in the ovaries of females. The DNA present in these cells can become damaged when exposed to radiation, and genetic alteration can occur if offspring are concieved within a short time following exposure. Damaged sperm and ova will eventually die following

exposure to radiation and if conception does not occur during this process, no harm will result. New sperm and ova will be produced and a healthy, normal conception may occur.

Gonad shielding:

Always attempt to reduce the amount of radiation that is delivered to the gonads of male and female patients. Exposure of the gonads can be reduced through the use of shielding and x-ray beam limitation.

Pregnant patients:

Women in the first three months (trimester) of pregnancy should not be exposed to radiation unless a life threatening situation exists. The patient's physician, radiologist, and the technologist should always ask female patients in the child bearing age group about the possibility of being pregnant prior to x-ray exposure.

Conclusion

Every attempt must be made to reduce the amount of radiation used in x-ray procedures. Over one-hundred techniques and/or technical devices exist that can be used to reduce the amount of radiation required for an examination, thus benefiting not only the patient, but radiology workers as well. Workers in radiology are expected to follow safety rules and safe practices to protect themselves, each other, and their patients from excessive exposure.

Generally, patients, radiology workers, and students do not demonstrate ill effects from the low radiation doses that are delivered during routine examinations. It is important, however, to follow safety rules so that the maximum permissible dose is not exceeded. If in doubt, always ask questions to gain a better understanding of what to do to protect yourself or the patient from radiation exposure and then consistently follow the rules.

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT VI RADIATION AND RADIATION SAFETY

SCOPE OF UNIT:

Students must understand the nature and characteristics of radiation in order to comprehend reasons for following rules of radiation safety. In this unit, students will be introduced to fundamentals of atomic structure, the nature of radiation, types of radiation, biological effects of radiation, and radiation safety.

INFORMATION TOPIC: X OR DEMONSTRATION:

RADIATION SAFETY
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. Define maximum permissible dose (MPD).
2. Identify the formula used to determine the maximum permissible dose (MPD) for a radiation worker.
3. Identify the approximate average dose that a radiologic technologist receives in a period of one year.
4. Define ALARA.
5. Identify the relationship between exposure time and radiation dose received.
6. Describe the relationship between the distance from a source of radiation and dose received.
7. Identify the material contained in radiation shielding devices.
8. Explain when shielding devices should be used.
9. Explain how fractionation of a radiation dose reduces its harmful effects.
10. Identify types of radiation produced during an x-ray procedure.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. HO 1: Primary/Secondary/Leakage Radiation

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

Hall, Eric J. Radiation and Life. Elmsford, NY: Pergamon Press, Inc. 1985.

INTRODUCTION:

The phrase "Safety First" is such an important idea that it is repeated over and over by employers and government agencies in campaigns to lessen the incidence of work-related injuries. If the average person would spend any time at all in an emergency room it would become evident that on-the-job injuries are usually due to carelessness. To avoid bodily harm it is important to follow rules of safety regardless of where we work.

Because radiation is invisible and its presence cannot be detected by relying on our senses, it is important to be safety conscious at all times when working around it. We can reduce our exposure to radiation to less than ten percent of the maximum allowed dose if we follow rules of safety, precisely and consistently.

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT VI RADIATION AND RADIATION SAFETY

OUTLINE: (Key Points)

I. Maximum Permissible Dose (MPD)

A. The maximum amount of radiation that is allowed for a radiation worker to receive in a period of one year. This dose is fixed at 5 rems or 5,000 millirems per year times the number of years exceeding 18 years of age.

B. The formula for computing MPD is as follows:
(n = age)
MPD = (n - 18) 5 rems

EXAMPLE: If a technologist is 20 years of age, the maximum permissible dose is calculated by subtracting 18 from 20 and multiplying the difference by 5.

C. The MPD for the general public or a student in radiology is fixed at .5 rems per year or 1/10 that of the full-time radiologic technologist.

D. A film badge is used in the x-ray department by radiology workers to monitor the amount of radiation they receive.

1. The average amount of exposure ranges between .24 to .48 rems per year.

2. Most badge readings do not exceed 10 percent of the allowable MPD.

3. It would take 1,000 times the MPD dosage level delivered all at one time to produce radiation sickness.

II. As Low as Reasonably Achievable (ALARA)

A. This concept is that the dose of radiation received by the patient, technologist, and other workers be kept as low as possible by following safety rules and observing safe practices during x-ray procedures.

B. Workers have a professional responsibility to keep their radiation dose to a minimum.

III. Rules of Time, Shielding, and Distance

A. Keep exposure time to a minimum.

1. The longer the exposure to radiation, the higher the radiation dose received.

2. If a source of radiation puts out 10 millirems per hour and exposure to the source lasts for 2 hours the dose received would be:

   10 millirems per hour/ X 2 = 20 millirems.

B. Stand behind or use protective shielding at all times.

1. Lead barriers in the walls of the x-ray room

2. Vinylclad lead aprons worn by the radiologist, technologist, and other radialogy workers

C. Stay as far away from the source of radiation as would be practical.

1. Distance - the amount of radiation received is reduced by increasing the distance from the source.

2. Inverse square rule - by doubling the distance from the radiation source, the radiation dose is reduced to 1/4 of the original amount; the radiation disperses and spreads out

IV. Fractionation of Radiation Dose

A. The amount of radiation received for the total yearly dose is divided into daily amounts; the body can tolerate much more radiation if it is received in small quantities at spaced intervals.

B. Most radiology workers will discover that some days they will receive no radiation exposure because of the use of safe practice.

C. Procedures involving higher risk of radiation exposure include fluoroscopy and portable x-ray work.

V. Types of Radiation Produced During an X-ray Procedure (HO 1)

A. Primary radiation - radiation coming directly from the x-ray tube to the patient within the area of the positioning light (target)

B. Secondary or scatter radiation - produced as primary beam is redirected once it contacts the patient and bounces off (scatters)

C. Leakage radiation - small amount of radiation that can be emitted from the x-ray tube housing

VI. Summary and Conclusion

A. Maximum permissible dose (MPD)

B. As low as reasonably achievable (ALARA)

C. Rules of time, shielding, and distance

D. Fractionation of radiation dose

E. Types of radiation produced during a procedure

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT VI RADIATION AND RADIATION SAFETY

INTERACTION ITEMS:

1. Why do radiology workers have a professional responsibility for keeping radiation exposure to a minimum?
2. Why does fluoroscopy produce a greater threat of radiation exposure?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT VI RADIATION AND RADIATION SAFETY

EVALUATION ITEMS

1. The formula that is used to determine the maximum permissible dose allowed for a radiation worker is: MPD =

   a. (n-18) 5
   b. (n-21) 5
   c. (n-20) 10
   d. (n-12) 18
   e. (18-5) n

2. A technologist receiving a dose of _____ rems in one year would be at the maximum permissible dose limit.

   a. .05
   b. .5
   c. 5
   d. 10
   e. 50

3. ALARA means

   a. Acceptable limits for the American Radiation Assoc.
   b. As low as reasonably achievable
   c. As low as the radiologist accepts
   d. Always as low as radiation practice allows
   e. Always loud and really awful

4. The maximum permissible dose (MPD) has been established as:

   a. The dose of radiation, that if received would produce harmful biological changes
   b. The amount of radiation that it would take to cause harm to the person receiving it
   c. The amount of radiation that it would be safe to be exposed to in a year's time assuming that no health problems exist
   d. The quanity of radiation that would cause some minor biological changes
   e. The amount of radiation that the average professional in the radiology department will receive in a lifetime

5. The effect of a long exposure to radiation is

   a. A lower radiation dose will be received
   b. It makes no difference as to dosage received
   c. It is unimportant as long as you remember to wear a vinylclad lead apron
   d. A higher radiation dose will be received
   e. Length of exposure does not have an influence on dosage

6. If we double the distance from three feet to six feet that we place between ourselves and a source of radiation, we will decrease the total dose of radiation received to

   a. 1/4 of the original amount
   b. 1/2 of the original amount
   c. 1/10 of the original amount
   d. 1/100 of the original amount
   e. 1/1000 of the original amount

7. Shielding is used in the radiology department in several ways. The material contained in shields which protects us from radiation is

   a. Aluminum
   b. Lead
   c. Rubber
   d. Copper
   e. Silver

8. A protective apron should be worn by the radiology worker

   a. Whenever an x-ray exposure is being made
   b. Only when he/she is standing in the control area behind the lead barrier
   c. When he/she must stand in the room where x-rays are being produced, or when using portable x-ray equipment
   d. a and b
   e. All of the above

9. Fractionation of radiation dose refers to the practice of

   a. Multiplying the amount of radiation received for the total yearly dose by the age of the radiation worker minus 2.
   b. Dividing the age of the radiation worker by the amount of radiation received for the year.
   c. Dividing the total yearly amount of radiation received into daily amounts
   d. Multiplying the yearly amount of radiation received by the daily amount

10. Primary radiation

   a. Comes directly from the x-ray tube and directly to the area of interest on the patient.
   b. Results from the x-rays interacting with the patient's body and scattering throughout the room
   c. Is emited in small amounts from the x-ray tube housing
   d. Is emitted by the patient after he/she is exposed to x-rays
   e. Is so low level that protection from it is not really necessary

LESSON PLAN: 2

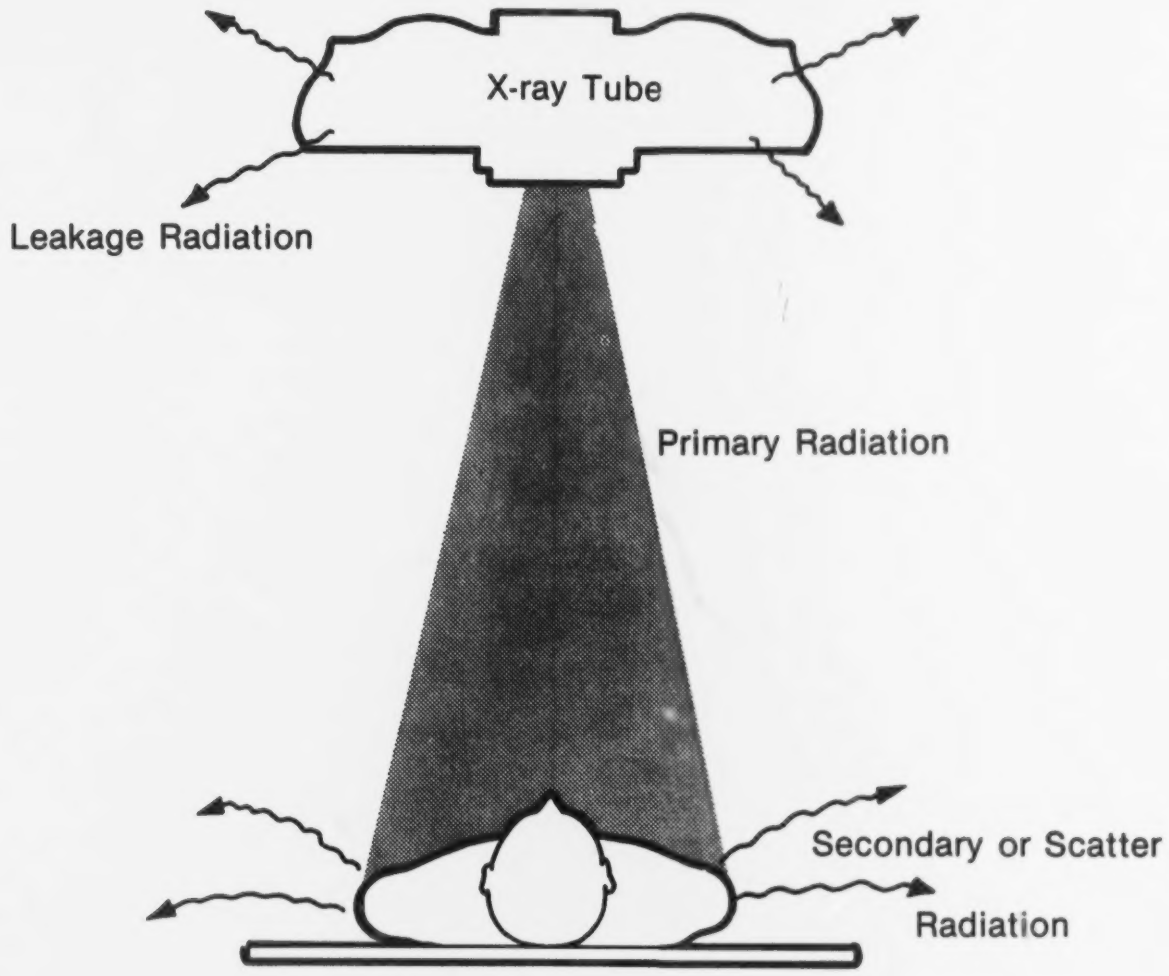
COURSE TITLE: RADIOLOGY AIDE

UNIT VI RADIATION AND RADIATION SAFETY

ANSWERS TO EVALUATION ITEMS

1. a
2. c
3. b
4. c
5. d
6. a
7. b
8. c
9. c
10. a

Primary / Secondary / Leakage Radiation



Avoid placing yourself in the primary beam.

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

SCOPE OF UNIT:

This unit contains an overview of microbiology, an introduction to types of microorganisms, and a discussion of terminology related to infection control. Methods of controlling the spread of infection, along with a discussion of isolation procedures and sterilization procedures, are also included.

INFORMATION TOPIC: X OR DEMONSTRATION:

MICROBIOLOGY, MICROORGANISMS, AND BASIC TERMINOLOGY OF INFECTION CONTROL
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. Define the term microbiology.
2. Match types of microorganisms to correct descriptions.
3. Match infection control terms to correct definitions/descriptions.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

It is suggested that the instructor provide diagrams of bacteria, virus, and fungi as visual aids for this lesson.

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

INTRODUCTION:

The control of infection and contagious diseases should be one of the most important jobs of the radiology aide and yet it is the one that is sometimes neglected. Maintaining a clean and sanitary environment in the radiology department is a difficult task when the department is busy. Many people come and go, and procedures and exams are completed quickly. Special care and concern must be paid to controlling the spread of infection by all radiology personnel. To do this, it is important to understand fundamentals of microbiology.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

OUTLINE: (Key Points)

I. Microbiology

A. Definition - study of microscopic living organisms (microorganisms) and their effects on other living things

B. A basic understanding of microbiology is necessary to understand the concept of infection control

II. Types of Microorganisms and Associated Diseases

A. Bacteria - a form of plant life that reproduces approximately every twenty minutes

1. Diseases caused by bacteria

a. Sore throat

b. Bladder infection

c. Skin infections

2. Types of bacteria

a. Coccus

b. Bacillus

c. Spirillum

3. Spore - reproductive seed or element of a bacterial organism

a. Has a covering that protects it from environmental conditions like heat and moisture

b. Bacteria contained in spores are difficult to kill and usually only steam heat under pressure (autoclave sterilization) can insure that all spores are destroyed.

B. Virus - an extremely small infectious agent consisting mostly of protein

1. Most are parasitic

   a. Grow within cells until the cell ruptures

   b. Adapt easily to new environments and are difficult to kill with medications

2. Diseases caused by virus

   a. Influenza (flu)

   b. Rabies

   c. Common cold

C. Fungi - any vegetable microorganism of the class to which mushrooms and molds belong

1. Present in soil, air, and water

2. Only a few species can cause disease

3. Diseases caused by fungi

   a. Athlete's foot

   b. Ringworm

III. Terms Related to Infection Control

A. Aerobic - microorganisms that require oxygen to survive

B. Anaerobic - microorganisms that grow best in the absence of oxygen, such as in puncture wounds where air cannot get to them

C. Antisepsis - any method of treatment that would prevent infection or kill microorganisms that cause infection

D. Antiseptic - a chemical substance that kills microorganisms

E. Contaminate - spreading of microorganism by direct or indirect contact

F. Disinfect - to kill most microorganisms but perhaps not resistant spores; a chemical disinfectant is used

G. Isolation - the act of separating or setting apart from others; patients with communicable disease are separated or isolated from other patients

H. Nosocomial disease - a disease caused as a result of being in a hospital or other patient care setting where the infection has spread from one patient to another, possibly as a result of poor aseptic technique

I. Prophylaxis - any method that can be used to effectively prevent infection

J. Sanitize/disinfect - to reduce the number of microorganisms to a minimum by cleaning

K. Sepsis - an infection or disease caused by a microorganism

L. Sterilize - to kill and destroy all microorganisms and all spores

II. Summary and Conclusion

A. Microbiology

B. Types of microorganisms and associated diseases

C. Terms related to infection control

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

INTERACTION ITEMS:

1. What are the three types of microorganisms?
2. What are the three types of bacteria?
3. What is the difference between sterilize, disinfect, and sanitize?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

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LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

EVALUATION ITEMS

1. Define the term microbiology.

Match the following terms with the appropriate definition or description.

_____	2.	Bacteria
_____	3.	Virus
_____	4.	Fungi
_____	5.	Spore
_____	6.	Contaminate
_____	7.	Sepsis
_____	8.	Isolation
_____	9.	Prophylaxis
_____	10.	Nosocomial
_____	11.	Sepsis
_____	12.	Antisepsis
_____	13.	Sterilize
_____	14.	Aerobic
_____	15.	Anaerobic
_____	16.	Sanitize

A. Spreading of microorganism by direct or indirect contact

B. Microorganisms that require oxygen to survive

C. To reduce the number of microorganisms to a minimum

D. Has a covering for protection from environmental conditions

E. Microorganisms that can live without air

F. Any method that can be used to effectively prevent an infection

G. Examples include mushrooms and mold

H. An infection or disease caused by a microorganism

I. A microorganism that is found in three shapes: coccus, bacillus, spirillum

J. A submicroscopic organism which causes diseases such as the common cold or flu

K. To kill all microorganisms including spores

L. The act of separating or setting apart from others

M. Any infection that is contracted by a patient from another patient or from poor aseptic procedure

N. An infection caused by a microorganism

O. Any method that could be used to eliminate infection

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

ANSWERS TO EVALUATION ITEMS

1. Microbiology is the study of microscopic living organisms (microorganisms) and their effect on other living things.

2. I
3. J
4. G
5. D
6. A
7. H
8. L
9. F
10. M
11. N
12. O
13. K
14. B
15. E
16. C

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

SCOPE OF UNIT:

This unit contains an overview of microbiology, an introduction to types of microorganisms, and a discussion of terminology related to infection control. Methods of controlling the spread of infection, along with a discussion of isolation procedures and sterilization procedures, are also included.

INFORMATION TOPIC: X OR DEMONSTRATION:

METHODS OF CONTROLING THE SPREAD OF INFECTION
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. List methods of controlling the spread of infection from person to person.
2. Name fixed objects used in the radiology department that should be disinfected regularly.
3. Name transportable objects used by the radiology department staff that should be disinfected regularly.
4. Name objects used in the radiology department that are considered disposable and should not be reused.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

INTRODUCTION:

Infection control requires all hospital workers to be aware that microorganisms can be spread through two basic methods: person to person (direct) contact, and person to object to person (indirect) transmission. Specific methods have to be consistently used by hospital workers in order to prevent the spread of infection.

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

OUTLINE: (Key Points)

I. Person to Person Spread of Infection

A. Infection is spread by direct contact with a patient or another worker who has a potentially communicable disease.

B. Can be controlled through

1. Hand washing - wash hands before and after working with each patient, following proper technique

2. Uniform

a. Wear a clean uniform each day.

b. Isolation gown - wear over uniform when assisting with a patient in isolation

3. Face mask and surgical clothing

a. When working around a sterile field or in an area that has a sterile field set up, wear surgical clothing including a face mask, cap, gown, and gloves.

b. When working with a patient in reverse isolation (burn patient) or a patient who has a contagious respiratory disease, you may have to wear a mask.

II. Indirect Spread of Infection Through Objects

A. Fixed objects - should be washed regularly with a disinfectant; cleaning cloths/towels should be disposed of

1. X-ray table

2. X-ray tube

3. Cabinet tops

4. Doors and doorknobs

5. Other furniture and/or fixtures that a patient might touch

B. Transportable objects that are permanent (not disposable) - should be washed regularly with a disinfectant and disposable cleaning cloths/towels

1. Film cassettes
2. I.V. stands
3. Wheelchairs
4. Carts

C. Disposable objects - must be properly disposed of; should never be washed and reused

1. Syringes
2. Needles
3. Cups
4. Bags and other containers
5. Gloves
6. Cleaning cloths/towels

III. Summary and Conclusion

A. Person to person spread of infection

B. Indirect spread of infection through objects

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

INTERACTION ITEMS:

1. In what ways can we prevent spread of infection?
2. What objects in a radiology department are handled most frequently or come in contact with a patient most frequently?
3. What are some methods of controlling the spread of infection?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

EVALUATION ITEMS

1. List two methods of preventing the spread of infection from person to person:

   a.

   b.

2. Name at least three fixed objects that a patient would come in contact with that should be disinfected regularly.

   a.

   b.

   c.

3. Name at least three mobile objects that should be washed and disinfected on a regular basis.

   a.

   b.

   c.

4. Name three items that are considered disposable that should not be reused.

   a.

   b.

   c.

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

ANSWERS TO EVALUATION ITEMS

1. Any two of the following:

   a. Handwashing - wash hands before and after working with each patient, following proper technique

   b. Uniform

      1. Wear a clean uniform each day.
      2. Wear coverings (isolation gown) over uniform when assisting with a patient in isolation.

   c. Face masks and surgical clothing when working with isolation patients or around sterile fields

2. Any three of the following:

   a. X-ray table and x-ray tube
   b. X-ray tube
   c. Cabinet tops
   d. Doors and doorknobs
   e. Other furniture and/or fixtures

3. Any three of the following:

   a. Film cassettes
   b. I.V. stands
   c. Wheelchairs
   d. Carts

4. Any three of the following:

   a. Syringes
   b. Needles
   c. Cups
   d. Bags and other containers
   e. Gloves
   f. Cleaning cloths/towels

LESSON PLAN: 3

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

SCOPE OF UNIT:

This unit contains an overview of microbiology, an introduction to types of microorganisms, and a discussion of terminology related to infection control. Methods of controlling the spread of infection, along with a discussion of isolation procedures and sterilization procedures, are also included.

INFORMATION TOPIC: X OR DEMONSTRATION:

STERILIZATION PROCEDURES
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. Match methods of sterilization to correct descriptions.
2. Identify items used in the radiology department that are sterilized by autoclave.
3. Identify items used in the radiology department that are sterilized by chemical gas sterilization.
4. Identify rules to follow when working in or near a sterile field.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. HO 1: Principles of Sterile Technique

INFORMATIONAL ASSIGNMENT: (Student)

HO 1: Principles of Sterile Technique

REFERENCES: (Instructor's Additional Information)

INTRODUCTION:

Sterilization of an article to rid it of contaminating microorganisms requires a specific procedure. Sterilization means that all microorganisms including spores are killed. This cannot be easily accomplished unless we follow proper procedure. An error will mean that we may not have sterilized an article properly or that we may have contaminated an article that is to be used. The result of all errors made when dealing with sterile fields and sterilized objects may be a potential nosocomial infection for the patient. Infections are devastating in that they prevent proper healing and, in some cases, can result in serious consequences for the patient. We must do everything we can to prevent errors and to follow proper procedure. A knowledge of the basics of sterilization procedure is a good place to begin to avoid making critical errors.

LESSON PLAN: 3

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

OUTLINE: (Key Points)

I. Methods of Sterilization

A. High temperature (heat)

1. Steam under pressure (autoclave) - 132°C (270°F) at 15 lbs. for 15 minutes; this method is used most frequently

2. Dry heat - hot air oven at 175°C (350°F) for 90 minutes

3. Moist heat - 55-60°C (131° - 140°F) for 30 minutes

4. Pasteurization - 62°C (144°F) for 30 minutes

5. Boiling - 100°C (212°F) for 10 minutes

6. Incineration of contaminated bandages and supplies

B. Chemical gas - ethylene oxide gas (12% ETO and 88% Freon 12) administered at a high temperature, 40 to 54° (105 to 130°F); the second most frequently used sterilization method

C. Chemical liquid - chemical sporicide solution - 8% formaldehyde + 70% isopropyl alchohol, glutaraldehyde; the third most frequently used method of sterilization

D. Radiation - 2000-4000 roentgen units (used in the industrial process of packaging disposable sterile bandages and supplies)

E. Sonic energy - high-energy sound waves used as part of industrial packaging of disposable sterile supplies and bandages

F. Alternate freezing and thawing

II. Limitations of Sterilization Methods

A. Autoclave

1. Exposes objects such as metal surgical instruments, sheets, and towels to extreme heat under pressure; some objects cannot withstand this heat without being destroyed

2. Items which cannot be autoclaved

a. Rubber catheters

b. Plastic items

c. Other items which could be permanently damaged by heat

B. Chemical liquid

1. Causes corrosion of metal

2. Some objects cannot be soaked in liquid because when dry they retain some of the chemical agent in crystalized form.

3. Bandages, drapes, and towels cannot be placed in a liquid sporicide.

C. Chemical gas

1. Ethlene oxide is expensive; only those articles that cannot be exposed to the high temperatures of autoclaving or liquid germicide should be gas sterilized.

2. Objects that are usually gas sterilized include optical instruments, teflon plastic catheters, electronic instruments.

D. Boiling

1. Boiling will kill most disease-producing organisms but will not kill some resistant spores.

2. Not considered to be an effective method of sterilization

III. Rules to Follow When Working In or Near a Sterile Field (HO 1)

A. The sterile area

1. All articles used in an operation or sterile procedure have been previously sterilized and packaged. The sterile packs are opened prior to the procedure.

2. If in doubt about the sterility of anything, consider it NOT sterile.

3. Tables are sterile only at table top level and are not sterile below the table top.

4. The external wrap (including the edge of the package opening) of anything that encloses sterile contents is not considered sterile.

5. Moisture may cause contamination of a sterile field.

6. When bacteria cannot be eliminated from a field, they must be kept to an irreducible minimum.

7. Skin cannot be sterilized.

B. The sterile worker

1. Sterile persons must not reach over an unsterile area.

2. Gowns are considered sterile from the waist to yoke level in front; sleeves are sterile from cuff to yoke in front and from cuff to elbow in back.

3. Sterile persons keep well within the sterile area.

4. Sterile persons keep handling of sterile articles to a minimum.

C. The nonsterile worker

1. Nonsterile persons must not lean over a sterile field

2. Nonsterile persons keep away from the sterile areas

IV. Summary and Conclusion

A. Methods of sterilization

B. Limitations of sterilization methods

C. Rules to follow when working in or near a sterile field

LESSON PLAN: 3

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

INTERACTION ITEMS:

1. How does sterilization differ from sanitizing? From disinfecting?
2. What are some frequently used sterile procedures?
3. How are disposable objects that come from medical supply companies sterilized?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

1. Instructor demonstrates the proper method of opening a sterile pack.

LESSON PLAN: 3

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

EVALUATION ITEMS

Match the description in the column on the right to the appropriate sterilization method in the column on the left. There may be more than one matching item per method, and one description may apply to more than one method.

_____	1.	High temperature (heat)	a.	Used for items that are disposable and prepackaged
_____	2.	Radiation		
_____	3.	Chemical gas	b.	Autoclaving
_____	4.	Sonic energy	c.	Pasteurization
_____	5.	Chemical liquid	d.	A mixture of formaldehyde and isopropyl alcohol
			e.	Ethlene oxide and freon

Match the item(s) from the column on the right to the appropriate description in the column on the left. There may be more than one matching item per description.

_____	6.	Item(s) that are autoclaved	a.	Optical instruments
			b.	Teflon plastic catheters
_____	7.	Item(s) that are gas sterilized	c.	Electronic equipment
			d.	Surgical instruments made of metal
			e.	Sheets and towels
			f.	Rubber catheters

For each of the following, write "T" if the statement is true, or "F" if the statement is false.

_____ 8. Boiling is an effective method of sterilization.

_____ 9. If in doubt about the sterility of an object you should assume that it is not sterile.

_____ 10. Human skin can be sterilized with the use of a chemical germicide.

_____ 11. The external wrap that encloses a sterile package is considered sterile.

_____ 12. A table that is considered to be a sterile field is not sterile below table top level.

_____ 13. Sterile gowns are considered sterile from the waist down.

_____ 14. The entire back of a sterile gown is to be considered sterile.

_____ 15. A liquid spill on a sterile table surface can contaminate the sterile field.

_____ 16. Handling of sterile objects should be kept to a minimum.

_____ 17. The most frequently used sterilization procedure is autoclaving.

_____ 18. Incineration or burning is a method of decontamination or sterilization.

LESSON PLAN: 3

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

ANSWERS TO EVALUATION ITEMS

1. b, c, e
2. a
3. e
4. a
5. d
6. d, e
7. a, b, c, f
8. F
9. T
10. F
11. F
12. T
13. F
14. F
15. T
16. T
17. T
18. T

PRINCIPLES OF STERILE TECHNIQUE

1. All articles used in an operation or sterile procedure have been previously sterilized. Workers who are sterile (wearing sterile gown, sterile face mask, sterile gloves) touch only articles that are considered to be sterile. People who are not sterile (not wearing sterile gowns, masks, and gloves) touch only nonsterile articles. All supplies that the sterile workers obtain are wrapped. The circulator, a worker who is not in sterile garb, will PROPERLY unwrap a sterile pack and allow a worker in the sterile field to reach for it with a pair of forceps.

2. If you are ever in doubt that you may have touched a sterile field always assume that you have. Always avoid leaning or reaching over a sterile field. A sterile worker will set basins or glasses to be filled at the edge of a sterile table. The circulation person outside the sterile field will stand near the edge of the sterile field and fill the receptacle with the requested solution, being careful not to spill it.

3. Do not leave a sterile field unguarded or unprotected prior to starting a procedure.

4. Tables are sterile only at table top level. Anything below table top is considered not sterile. Linen or suture falling over a table edge are discarded and the sterile worker does not touch the part hanging below table top level.

5. Gowns are considered sterile only from waist to yoke level in front. Sleeves are sterile from cuff to yoke in front and from cuff to elbow in back. Sterile workers are to keep their hands in sight, at or above waist level. Hands are to be kept away from the face, with elbows held close to the sides. When a sterile worker stands on a platform, the low area of the gown brought up to a higher level must not brush against the sterile field. Articles dropped below waist level are discarded.

6. The external wrap (including the edge of the package opening) of anything that encloses sterile contents is not considered sterile. Sterile workers lift contents from packages by reaching down and lifting the object straight up, holding elbows high.

7. Sterile workers keep well within the sterile field. Nonsterile workers keep away from sterile areas. Sterile workers should stand back a safe distance from the sterile table when draping the patient. Sterile workers pass each other back to back. A sterile worker faces a sterile field when passing it. Nonsterile workers allow a wide margin of safety when passing sterile areas, and follow the rule for passing: face the sterile field when passing it so you can be sure that you have not touched anything in the sterile field.

8. Moisture may cause contamination. When moisture soaks through a sterile area to a nonsterile area, or vice versa, it provides a means of transporting bacteria to the sterile area. Sterile packages are placed in dry areas. If a

sterile package becomes damp, or wet, it must be resterilized or discarded. If a solution soaks through a sterile area to a nonsterile one, the wet area is covered with another sterile drape with at least two thicknesses of material. Linen packages from the sterilizer are permitted to cool before being put on shelves to prevent dampness from steam condensation when in contact with a cold shelf.

9. When bacteria cannot be eliminated from a field, they must be kept to an irreducible minimum. The patients skin is not sterile and cannot be sterilized prior to a procedure. We can scrub skin with an antiseptic and shave off hair where it may contaminate the field. In draping, all the skin is covered except the area of interest. All workers that are to put on sterile gowns and gloves must use proper hand scrub procedure. Physicians and workers gown and glove without touching the outside of the gown and gloves to the bare hands. If a glove is punctured by a needle or instrument, the glove is changed at once and the needle or instrument discarded from the sterile field.

LESSON PLAN: 4

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

SCOPE OF UNIT:

This unit contains an overview of microbiology, an introduction to types of microorganisms, and a discussion of terminology related to infection control. Methods of controlling the spread of infection along with a discussion of isolation procedures and sterilization procedures are also included.

INFORMATION TOPIC: X OR DEMONSTRATION:

ISOLATION PROCEDURE
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. Match the types of isolation with their proper description.
2. Identify precautions to be taken when presented with the six types of isolation.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. TM 1: Sample Barrier Card

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

Ehrlich, Ruth Ann and Ellen M. Givens. Patient Care in Radiography. St. Louis: The C.V. Mosby Publishing Company, 1985.

INTRODUCTION:

Although isolation procedure and requirements for various types of isolation will vary from hospital to hospital, there are some standard principles that will be emphasized in this lesson. Diseases are caused by microorganisms that are communicable to other patients and to hospital workers. Microorganisms enter and leave the body through any body orifice as well as through breaks in the skin. Precautions must be taken to protect yourself and others from becoming infected and contaminated. You will spread disease-producing organisms if you do not understand and follow isolation procedures.

LESSON PLAN: 4

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

OUTLINE: (Key Points)

I. Principles of Isolation

A. Private room - barrier card (placard) must be clearly displayed on the door to the isolation room (TM 1)

B. Aseptic supplies

1. Gowns, gloves, masks and other necessary items to cover the worker's body for protection

2. Located outside of the isolation room or in anteroom

3. Must be put on prior to entering the room

C. Handwashing

1. Prior to putting on protective clothing

2. After taking off protective clothing

D. Discard protective clothing

1. In a plastic bag or container in the patient's room

2. Prior to leaving the room

II. Types of Isolation and Precautions

A. Complete isolation - attempts to contain contagious diseases spread through multiple routes

1. Diseases treated in complete isolation

a. Diphtheria

b. Chickenpox and smallpox

c. Rabies

d. Pneumonias caused by staph or strep

2. Precautions for complete isolation

a. Barrier card

b. Private room required

c. Filtered exhaust fan to outside

d. Hands must be washed upon entering or exiting the room

e. Gloves must be worn

f. Excretions must be discarded with care

g. Secretions discarded with care

h. Linen double bagged

i. Dishes bagged

j. Terminal disinfection of equipment required upon leaving room

B. Reverse or protective isolation - used for patients susceptible to infection because of weakened condition

1. Patients treated in reverse or protective isolation

a. Patients with burns

b. Newborn babies

c. Leukemia patients

2. Precautions for reverse or protective isolation

a. Barrier card

b. Gown, mask and cap should be worn by all personnel and visitors

c. Gloves should be worn if the patient is to be handled

d. Hands washed before entering room

e. Environment isolated from regular patient care areas

C. Enteric isolation - used for patients who have infectious diseases of the gastrointestinal tract

1. Diseases treated in enteric isolation

a. Cholera

b. Bacterial gastroenteritis

c. Salmonella

d. Amebiasis

2. Precautions for enteric isolation

a. Barrier card

b. Hands washed before and after patient contact

c. Gowns and gloves worn when in direct contact with patient

d. Eating utensils and other equipment sterilized

e. Excretions, secretions and uneaten food discarded with care

D. Wound or skin isolation - used for patients with skin that is infected by microorganisms which are easily spread by direct contact

1. Diseases treated in wound or skin isolation

a. Staphylococcal wound/skin infection

b. Gas gangrene

c. Herpes (simplex and zoster)

d. Impetigo

2. Wounds covered and protected by a bandage not leaking or soaked through with blood or exudate reduce communicability of infection and patient is considered safe to be around.

3. Fistula tract infections - some fistulas are highly susceptible to staphylococcus bacteria infections which are very communicable

4. Precautions for wound or skin isolation

a. Barrier card

b. Hands must be washed before and after patient contact

c. Gowns, gloves and masks are necessary when changing dressings

d. Soiled dressings properly discarded

e. Equipment disinfected

E. Respiratory Isolation - used to contain infectious lung diseases

1. Diseases treated in respiratory isolation

a. Mumps

b. Influenza

c. Whooping cough (pertusis)

d. Pulmonary tuberculosis

e. Infectious mononucleosis

2. Precautions

a. Barrier card

b. Patient should wear a face mask

c. Anyone in close contact with the patient should wear a face mask

d. Tissues used to blow the nose should be bagged and incinerated

e. Private room

F. Hepatitis - a viral infection of the liver carried in the gastrointestinal tract or in the blood.

1. Types of hepatitis

a. Type A (infectious hepatitis) - carried in the GI tract

b. Type B (serum hepatitis) - carried in the blood

2. Precautions

a. Barrier card

b. Hands washed

c. Gowns and gloves for direct contact with patient

d. Excretions properly discarded

e. Contaminated needles and syringes properly disposed of

f. Dishes, linen and equipment disinfected or sterilized

III. Patient's Role

A. Be aware of the rules of the type of isolation under which they have been placed

B. Remind workers and visitors to follow procedure

C. Perform specific tasks where appropriate

1. Wash hands

2. Wear face mask

IV. Summary and Conclusion

A. Principles of isolation

B. Types of isolation and precautions

C. Patient's role

LESSON PLAN: 4

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

INTERACTION ITEMS:

1. What is the purpose of the barrier cards posted on the isolation room door?
2. What precautions must be taken with wound infections covered with a bandage?
3. What is the difference between hepatitis A and hepatitis B?
4. What is the role of the patient in isolation?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

LESSON PLAN: 4

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

EVALUATION ITEMS

Match the following statements with the correct type of isolation.

A. Used for a patient with extensive burns
B. Used for tuberculosis or other infectious lung diseases
C. Used for infectious diseases of the gastrointestinal tract
D. Used to contain potentially epidemic diseases
E. Used for patients with a wound infection

_____ 1. REVERSE or PROTECTIVE ISOLATION

_____ 2. RESPIRATORY ISOLATION

_____ 3. ENTERIC ISOLATION

_____ 4. WOUND OR SKIN ISOLATION

_____ 5. COMPLETE ISOLATION

For each of the following write "T" if the statement is true, or "F" if the statement is false.

_____ 6. The isolation patient should wash his/her hands before and after someone enters the room.

_____ 7. A visitor's hands must be washed upon entering and leaving an isolation room for all types of isolation.

_____ 8. Patients in respiratory isolation who wear a mask can be safely brought to the radiology department for an examination.

_____ 9. Patients in contact isolation or wound isolation should be isolated in a private room.

_____ 10. Barrier cards serve the purpose of providing isolation procedure instructions for all persons wishing to enter the isolation room.

_____ 11. Hepatitis is a disease that can be transmitted if you come in contact with the blood serum, stool, saliva or other body fluids of an infected patient.

LESSON PLAN: 4

COURSE TITLE: RADIOLOGY AIDE

UNIT VII INFECTION CONTROL

ANSWERS TO EVALUATION ITEMS

1. A
2. B
3. C
4. E
5. D
6. F
7. T
8. T
9. T
10. T
11. T

Sample Barrier Card

ISOLATION

Visitors and non-unit personnel must report to nurse before entering this room.

Procedure

1. Hands must be washed.
2. Gowns, gloves and masks must be worn.
3. Excretion and secretion precautions are necessary.
4. Linen and dish precautions are necessary.
5. Aftercare of equipment and terminal disinfection are necessary.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT VIII TRANSPORTING PATIENTS

SCOPE OF UNIT:

This unit presents proper methods for lifting and transporting patients. Comprehension of body mechanics and transfer techniques will help to avoid back strain and injury to the worker and will ensure safety to the patient.

INFORMATION TOPIC: X OR DEMONSTRATION:

BODY MECHANICS
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. Define center of gravity as it relates to the object lifted.
2. Describe the proper body stance for lifting an object.
3. List the principles of lifting.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. HO 1: Points to Remember for Moving and Lifting Patients
2. Slide/tape presentation - "Body Mechanics and Basic Transfers" (direct inquiries to: James A. Martin, 702 N. 76th St., Omaha, NE 68114)

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

INTRODUCTION:

Back strain due to improper lifting of objects or patients is a common ailment of hospital workers. Back strain can lead to permanent injury of the back but can be avoided if proper lifting techniques are used. This lesson presents body mechanics and lifting principles to assist in preventing injuries to the aide. Your safety is essential to patient safety.

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT VIII TRANSPORTING PATIENTS

OUTLINE: (Key Points)

I. Center of Gravity

A. Definition - point at which the weight of the object is balanced

B. Determine the center of gravity by locating and lifting the object at its balance point.

C. Location of center of gravity of a standing person is approximately at the level of the sacrum.

D. Force applied at the center of gravity will start the person moving in the direction of the force that you apply.

E. If you are carrying or supporting weight when lifting, attempt to get the object's weight above your center of gravity.

II. Proper Body Stance

A. Establish a base of support - the foundation that supports the weight during a lift.

B. Assume position.

1. Place the feet apart at approximately shoulder width.

2. Put one foot forward to help maintain balance.

III. Principles of Lifting

A. Bend at your hips and knees.

1. Use your legs to lift, not your back.

2. Keep your back straight.

B. Stand as close as possible to the object you are about to lift.

1. Do not lean over a surface to lift an object.

2. Do not lift objects located over your head.

3. If you must push, pull, or lift, make sure that you use the muscles in your arms and legs, not your back muscles.

C. Tighten your abdominal muscles as you lift. This provides support to your vertebral (spinal) column.

D. Shift feet to turn. This prevents the spinal column from twisting.

IV. Summary and Conclusion

A. Center of gravity

B. Proper body stance

C. Principles of lifting

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LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT VIII TRANSPORTING PATIENTS

INTERACTION ITEMS:

1. What type of injury is the most common injury a hospital worker sustains on the job?

2. What is the name of the point at which an object can be balanced?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

1. Demonstrate the proper methods of lifting and transfering an object as presented in this lesson.

2. Demonstrate the center of gravity of a standing person. Have another person stand and push gently from various directions: at the shoulder, the upper back and at the level of the sacrum.

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT VIII TRANSPORTING PATIENTS

EVALUATION ITEMS

1. Define center of gravity as it relates to the object being lifted.

2. List three points concerning proper body stance for lifting an object.

   a.

   b.

   c.

3. State four principles of good body mechanics that are to be used when lifting a patient or an object.

   a.

   b.

   c.

   d.

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT VIII TRANSPORTING PATIENTS

ANSWERS TO EVALUATION ITEMS

1. Point at which weight of the object is balanced

2. a. Establish proper base of support
   b. Place the feet apart at shoulder width
   c. Put one foot forward

3. a. Bend at hips and knees, use legs to lift and keep back straight

   b. Stand as close as possible to object being lifted, do not lean over a surface to lift; do not lift overhead

   c. Tighten your abdominal muscles as you lift

   d. Shift feet to turn to prevent twisting of spinal column

POINTS TO REMEMBER FOR MOVING AND LIFTING PATIENTS

1. Stand facing the direction of the move.
2. Place your feet wide enough apart to give good balance. This is usually the width of your shoulders.
3. Place one foot well in front of the other and rock back on your legs to move forward or backward.
4. Keep your back as straight as possible.
5. Flex your knees to lower your body to the working level.
6. Use the strong muscles of your legs and arms to lift. Muscles of the back are not strong enough to lift and, if used primarily to lift, an injury will occur.
7. Never lift an unconscious, wet or extremely heavy person alone.
8. When working with others in lifting have a signal for all lifting to be done at the same time.
9. Encourage the patient to use every muscle he/she is able to in helping to make the move. Everything patients can do for themselves reduces what you will have to do.
10. Roll or slide a patient when possible, instead of lifting him/her.
11. Explain what is to be done to the patient so he/she can assist and do his/her part.
12. Make use of the head of the bed, side rails, a trapeze or other device whenever possible.

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT VIII TRANSPORTING PATIENTS

SCOPE OF UNIT:

This unit presents proper methods for lifting and transporting patients. Comprehension of body mechanics and transfer techniques will help to avoid back strain and injury to the worker and will ensure safety to the patient.

INFORMATION TOPIC: OR DEMONSTRATION: X

MOVING PATIENTS
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. Move a patient from a bed or x-ray table to a cart and back again using correct body mechanics according to the steps of procedure.

2. Move a patient from a sitting position to a wheelchair using correct body mechanics according to the steps of procedure.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. HO 1: Hints in Transfers

2. Slide/tape presentation - "Body Mechanics and Basic Transfers" (direct inquiries to: James A. Martin, 702 N. 76th St., Omaha, NE 68114)

INFORMATIONAL ASSIGNMENT: (Student)

HO 1: Hints in Transfer

REFERENCES: (Instructor's Additional Information)

INTRODUCTION:

Patients must be transported safely from place to place within the hospital. In many cases errors are made because we may have a tendency to assume that the patient can make it on his or her own. Patients will often attempt to do too much for themselves. This lesson is intended to introduce the student to the fundamentals of transferring a patient using a cart or a wheel chair.

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT VIII TRANSPORTING PATIENTS

STEPS OF PROCEDURE:

I. Procedure Before and After Moving Patients

A. Prior to moving the patient inform the nursing staff that you are moving a patient from the floor to the radiology department.

1. State name of the patient.

2. Indicate where you are taking patient.

B. After returning patient, inform the nursing staff that the patient has returned to the floor.

1. Report on the patient's condition.

2. Indicate if the patient needs immediate attention.

II. Transporting Patients Using a Cart

A. The more incapacitated the patient, the greater the number of people necessary to assist with the transfer of the patient from bed to cart.

B. Three person transfer procedure

1. Inform the patient how he/she can help with the move.

2. Slide the patient as close to the edge of the bed as possible.

3. Place a cart parallel to the bed.

4. Two people stand along the near side of the cart.

a. One person places his/her hands under the patient's shoulders.

b. The other person places his/her hands under the patient's hips.

5. The third person stands on the far side of the bed or opposite the other two lifters.

a. This person holds the draw sheet tight and lifts, or

b. Places one hand under the shoulder area and one under the hips.

6. Coordinator counts or gives signal and everyone lifts as a team.

a. Two people lift and pull patient toward them.

b. Third person lifts, supports and pushes patient toward cart.

7. Secure the patient on the cart using a safety strap and side rails.

C. Patient's role in the transfer

1. Place arms across chest.

2. Keep legs together and straight.

3. Hold head up during transfer.

4. Keep body stiff during transfer.

III. Moving Patients by Wheelchair

A. Bring patient to a sitting position.

1. Mechanical surface - place head of the bed in an upright position

2. Non-mechanical surface (e.g. an x-ray table)

a. Turn patient onto side, with knees flexed.

b. Place one arm under the patient's shoulders, supporting the head and neck.

c. Place other arm around the patient's legs at the knees.

d. Shift weight from front to back leg.

1. Pull patient's shoulders up.

2. Swing patient's legs over edge of table.

3. Alternate method is to have the patient pull himself/herself to an upright position by holding on to your arm.

B. Transfer patient to a wheelchair.

1. Place the wheelchair parallel to or slightly diagonal to the side of the bed so the patient is moving toward his/her stronger side.

2. Lock the brakes on the wheelchair to prevent the chair from rolling as you place the patient in it.

3. Lift the footrests of the chair; if the legrests are the swing-away or removable type, swing them out of the way or remove them.

4. Have the patient move forward so his/her feet are flat on the floor and slightly apart. If the patient cannot move forward independently, you may need to assist him/her.

5. Stand in front of the patient toward the patient's involved side.

6. Block the patient's involved foot with your foot nearest to the wheelchair and his/her knee with your knee. (Spread your feet slightly to increase your base of support and if needed, bend at the hips and knees, not the back.)

7. Place your arms around the patient's shoulders or waist, not under the involved arm.

8. Have the patient place his/her uninvolved hand on the bed.

9. Have the patient lean forward over the uninvolved knee, then push with the uninvolved knee while pushing with the uninvolved hand to stand. (Keep the involved knee blocked with your knee.)

10. Ask the patient to reach and take hold of the armrest farthest from the bed with the uninvolved hand.

11. Have the patient pivot on the uninvolved foot while you step around with the free foot. Neither of you should be twisting at the trunk to accomplish this.

12. You are now standing in front of the chair. Ask the patient to lean forward over the uninvolved knee and lower into the chair. Bend your hips and knees as the patient sits.

13. Cover the patient's legs with a sheet or blanket.

IV. Moving Intravenous Equipment, Urine Bags and Chest Tubes

A. Intravenous equipment

1. Protect the site of venipuncture from being pulled out of position.

2. Do not let the patient pull or push with the extremity which is the I.V. site.

3. Maintain the I.V. bottle or bag above the venipuncture site to prevent retrograde flow or stoppage of the I.V.

B. Urine bags

1. Keep urine bags below the level of the bladder at all times.

2. If this cannot be prevented, place a clamp across the catheter to prevent retrograde flow of drained urine from the bag or tube back into the bladder.

C. Chest tubes

1. Never move a patient with chest tubes without first checking with the patient's nurse.

2. The chest tube should be clamped off with a double clamp.

V. Summary and Conclusion

Review steps of procedure.

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT VIII TRANSPORTING PATIENTS

INTERACTION ITEMS:

1. What is the patient's role in a transfer from bed to a cart?
2. Under what circumstances should you get help in moving a patient by wheelchair?
3. What steps must be taken when moving patients with I.V.'s, urine bags or chest tubes?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

Practice the procedures using:

1. Wheelchair
2. Patient bed
3. Cart

LESSON PLAN: 2

COURSE TITLE: RADIOLOGY AIDE

UNIT VIII TRANSPORTING PATIENTS

EVALUATION ITEMS

MOVING PATIENTS

DID THE STUDENT:	YES	NO
PRIOR TO MOVING PATIENT		
1. Inform nursing staff that you are moving a patient from the floor to the radiology department.		
2. State name of the patient.		
3. Indicate where you are taking patient		
AFTER RETURNING PATIENT		
1. Inform nursing staff that the patient has returned to the floor.		
2. Report on the patient's condition.		
3. Indicate if the patient needs immediate attention.		
TRANSPORT PATIENTS USING A CART UTILIZING THE THREE PERSON TRANSFER PROCEDURE.		
1. Inform patient how he/she can help with the move.		
2. Slide patient as close to the edge of the bed as possible.		
3. Place cart parallel to the bed.		
4. Stand along the near side of the cart. a. Position one: place hands under the patient's shoulders.		
b. Position two: place hands under the patient's hips.		
5. Stand on the far side of the bed or opposite the other two lifters (position three).		

	YES	NO
a. Hold the draw sheet tight and lift or		
b. Place one hand under the shoulder area and one under the hips.		
6. Count or give signal as everyone lifts.		
a. Position one or position two: lift and pull patient toward you.		
b. Position three: lift support and push patient toward cart.		
7. Secure patient on cart using safety strap and side rails.		
8. Advise patient of his/her role in transfer.		
a. Place arms across chest.		
b. Keep legs together and straight.		
c. Hold head up during transfer.		
d. Keep body stiff during transfer.		
MOVE PATIENT BY WHEELCHAIR.		
1. Bring patient to a sitting position. a. Mechanical surface - place head of the bed in an upright position,		
b. Non-mechanical surface (1) Turn patient onto side, with knees flexed.		
(2) Place one arm under the patient's shoulders, supporting the head and neck.		
(3) Place other arm around the patient's legs at the knees.		
(4) Shift weight from front to back leg. (a) Pull patient's shoulders up.		
(b) Swing patient's legs over edge of table.		
c. Alternate method - patient pulls himself/herself to an upright position by holding on to aide's arm.		

		YES	NO
2.	Transfer patient to a wheelchair.		
a.	Place the wheelchair parallel to or slightly diagonal to the side of the bed so the patient is moving toward his/her stronger side.		
b.	Lock the brakes on the wheelchair.		
c.	Lift the footrests of the chair; if the legrests are the swing-away or removable type, swing them out of the way or remove them.		
d.	Have the patient move forward so his/her feet are flat on the floor and slightly apart. (Assist patient if necessary.)		
e.	Stand in front of the patient toward the patient's involved side.		
f.	Block the patient's involved foot with aide's foot nearest to the wheelchair and patient's knee with aide's knee.		
g.	Place arms around the patient's shoulders or waist.		
h.	Have the patient place his/her uninvolved hand on the bed.		
i.	Have the patient lean forward over the uninvolved knee, then push with the uninvolved knee while pushing with the uninvolved hand to stand. (Keep the involved knee blocked with aide's knee.)		
j.	Ask the patient to reach and take hold of the armrest farthest from the bed with the uninvolved hand.		
k.	Have the patient pivot on the uninvolved foot while aide steps around with the free foot.		
l.	While standing in front of the chair, ask the patient to lean forward over the uninvolved knee and lower into the chair. Bend at hips and knees as the patient sits.		
m.	Cover the patient's legs with a sheet or blanket.		

	YES	NO
MOVE INTRAVENOUS EQUIPMENT.		
1. Protect the site of venipuncture from being pulled out of position.		
2. Do not let the patient pull or push with the extremity which is the I.V. site.		
3. Maintain the I.V. bottle or bag above the venipuncture site to prevent retrograde flow or stoppage of the I.V.		
MOVE URINE BAGS.		
1. Keep urine bags below the level of the bladder at all times.		
2. If this cannot be prevented, place a clamp across the catheter to prevent retrograde flow of drained urine from the bag or tube back into the bladder.		
MOVE CHEST TUBES.		
1. Checked with the patient's nurse before moving patient.		
2. Clamped off chest tube with a double clamp.		

The student has satisfactorily completed the procedure "MOVING PATIENTS" according to the steps outlined.

_____
INSTRUCTOR'S SIGNATURE
(VERIFYING SATISFACTORY COMPLETION)

_____
DATE

HINTS IN TRANSFERS

1. All equipment must be in good working order and must be made stationary for the transfer. Check brakes.

2. Take your time in making the transfer being careful not to wear out the patient or yourself.

3. When lifting sheets are used, be certain they will hold the patient. The sheet should be large enough to maintain the weight of the entire chest and abdomen.

4. Stabilize the arms and legs when transferring a patient to or from a cart. Have the patient fold his/her arms over his/her chest. Have the patient keep his/her legs together.

5. Never lift or move a patient by yourself if that patient cannot assist in the move. In cases of doubt about your ability or the patient's ability to make the move, get help.

6. Moving toward the patient's stronger side is helpful.

7. Equalize the heights of the transfer surfaces.

8. When standing to transfer, have patient move head and trunk forward. This brings the center of gravity forward and helps patient to stand with minimal effort.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT IX PATIENT PREPARATION FOR EXAMINATION

SCOPE OF UNIT:

This unit provides the basic standard of patient preparation for most routine radiographic examinations. Proper and complete patient preparation is essential for ensuring a successful examination procedure.

INFORMATION TOPIC: X OR DEMONSTRATION:

PATIENT PREPARATION FOR EXAMINATION
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. Name three types of physician's orders used for patient preparation for a radiographic exam.
2. State the two modes of patient dress and the examinations for which they are required.
3. Define the term radiographic artifact.
4. Identify the most common items which cause radiographic artifacts.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. X-ray demonstrating an artifact

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

Ballinger, Phillip W. Merrill's Atlas of Roentgenographic Positioning and Procedures. Vols. I-III, 6th ed. St. Louis: C. V. Mosby Company, 1986.

Griffiths and Sarno. Contemporary Radiology, An Introduction to Imaging. Philadelphia: Saunders Publishing, 1979.

INTRODUCTION:

The usefulness of radiographs produced with complex procedures and routine radiographic exams is directly related to whether or not the patient has been adequately prepared for the examination. The radiology department is responsible for establishing the requirements for patient preparation for each type of examination performed. Some patient preparation requires physician's orders while other preparations are simple things like having the patient remove all metal objects from his/her body. MRI (magnetic resonance imaging), a new technology used to produce diagnostic images, requires female patients to remove all eye make-up prior to a head or neck scan. Some eye make-up has iron oxide in it which will ruin the image due to the fact that iron is a magnetic material. The radiology aide plays a very important role in the radiology department by ensuring proper patient preparation prior to procedures.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT IX PATIENT PREPARATION FOR EXAMINATION

OUTLINE: (Key Points)

I. Physician's Orders

A. Medication orders

1. List on the request for examination form any medication orders that may affect the patient's condition and ability to cooperate.

2. Convey this information to the radiology department staff.

3. Types of medication

a. Insulin - patients often are fasting for a procedure and sometimes get their insulin by accident

b. Nitroglycerine - patients who have angina pectoris must carry this with them at all times

c. Pain medication - may alter the patient's behavior and equilibrium; be sure to stay with the patient

B. Dietary orders and bowel preparation orders

1. Dietary Orders

a. NPO - means nothing by mouth prior to the procedure; assure the patient he/she will be allowed to eat and drink as soon as the procedure is completed

b. Exams requiring NPO orders:

1. Upper gastrointestinal series

2. Gallbladder

3. Lower gastrointestinal exam, (barium enema)

4. Intravenous pyelogram

2. Bowel preparation orders

a. Laxatives and cleansing enemas for patients receiving exams of the abdominal cavity

b. Exams requiring bowel preparation orders

1. Intravenous pyelograms

2. Lower GI studies

II. Patient's Dress

A. Partial disrobing

1. Many procedures require only a part of the body be exposed.

2. A chest exam for example usually requires removal of everything from the waist up, including all jewelry, etc.

3. Exams requiring partial disrobing

a. Skull

b. Chest

c. Cervical spine

d. Thoracic spine

B. Complete disrobing

1. Other procedures involving the main or lower portions of the trunk require that the patient completely disrobes.

2. Exams requiring complete disrobing

a. Lumbar spine

b. Upper gastrointestinal series

c. Lower gastrointestinal series

C. Disrobing guidelines

1. Incapacitated patients require help when dressing or undressing

2. Never expose a patient's body unnecessarily

3. Ensure patient's privacy while changing

4. Provide clear and complete instructions to patient regarding

   a. Everything to be removed

   b. How to wear examination gown

5. Put patient's belongings in a secure place for safe keeping

III. Radiographic Artifacts

A. Definition - unwanted density or image on a radiograph due to the presence of an object (such as a necklace) on the patient's body which was not removed prior to an examination.

B. An artifact found on the film in the area the doctor is examining creates unneeded images and requires that the procedure be repeated after removal of the object.

C. Common objects that cause artifacts

1. Skull exam

   a. Earrings

   b. Hairpins

   c. Rubber bands

   d. Braids

   e. Eyeglasses

   f. Hearing aid

   g. Necklaces

2. Chest exam

   a. Necklaces (most common)

   b. Shirt/blouse

   c. Bra

   d. Safety pins

   e. Some bandages (cannot always be removed)

3. Arm or leg exam

   a. Rings

b. Watches

c. Bracelets

d. Clothing which covers the limb to be examined

IV. Summary and conclusion

A. Physician's orders

B. Patient's dress

C. Radiographic artifacts

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT IX PATIENT PREPARATION FOR EXAMINATION

INTERACTION ITEMS:

1. What is the importance of knowing what medications a patient is taking?

2. What is the most common artifact found on chest x-rays as a result of incomplete patient preparation?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT IX PATIENT PREPARATION FOR EXAMINATION

EVALUATION ITEMS

Answer the following questions as either "true" or "false".

_____ 1. N.P.O., nothing by mouth, means the patient may not have food or liquids for a specified time prior to examination.

_____ 2. Examinations requiring bowel preparation orders are upper gastrointestinal and gallbladder procedures.

_____ 3. It is necessary to list on the request for examination form any medications the patient is receiving.

_____ 4. All examinations require only a partial disrobing of the patient.

_____ 5. Patients receiving pain medication can be left alone.

6. Complete the following statement giving the definition of a radiograph artifact by correctly filling in the blanks.

An artifact is _____ on _____

due to _____

which were _____.

7. List two items for each type of exam indicated that would cause artifacts and which the patient must remove while disrobing.

Skull

a.

b.

Cervical Spine

a.

b.

Chest

a.

b.

Limbs

a.

b.

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LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT X RADIOLOGY PROCEDURES

SCOPE OF UNIT:

This unit will familiarize the student with procedures for completing routine radiographic examinations. The purpose and content of a radiology department procedure manual will also be discussed.

INFORMATION TOPIC: X OR DEMONSTRATION:

RADIOLOGY PROCEDURES
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. State the purpose of a procedure manual.
2. Describe the content of six categories of a radiology procedure manual.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

Ballinger, Phillip. Merrill's Atlas of Roentgenographic Positioning and Procedures. Vols. I-III. St. Louis: C.V. Mosby Company. 1986.

INTRODUCTION:

The key to a successful diagnostic procedure lies in the quality of the performance of the procedure. Procedures must be conducted in a standard manner in order to provide a method of controlling the variables that can affect a diagnosis. When all aspects of a procedure are carried out in a standard manner, the outcome of the procedure will lead to an accurate picture of a patient's health problem. Each procedure performed will have a description included in the department's procedure manual. This lesson examines the purpose of the procedure manual and the categories of information it contains.

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT X RADIOLOGY PROCEDURES

OUTLINE: (Key Points)

I. Purpose of a Radiology Procedure Manual

A. To reduce the number of variables by standardizing procedures

B. To obtain accurate and dependable diagnostic results

II. Procedure Manual Categories

A. Purpose of a procedure - to examine an organ by x-ray to determine if disease or abnormal function is present

1. Name the part of anatomy being demonstrated on film

2. Example - upper gastrointestinal series shows the esophagus, stomach and duodenum

B. Patient preparation - orders to be carried out by nursing staff prior to procedure to ensure patient is ready for examination

1. Diet and medication orders to be followed prior to the procedure

2. Bowel preparation orders

3. Partial or complete disrobing

C. Contrast medium - material or compound used in the procedure to highlight the organ to be x-rayed

1. Not all radiology procedures require the use of a contrast mediums

2. Specify the contrast medium to be used

3. Give directions for mixing the contrast medium to obtain proper thickness and concentration

4. Example - upper gastrointestinal series requires use of barium sulfate

D. Supplies and equipment - x-ray equipment, film, and medical supplies used to complete the procedure

1. Leasing equipment

2. Set up appropriate equipment.

3. Obtain adequate amount of disposable supplies.

4. Have ready the proper size and number of x-ray film cassettes.

E. Steps of the procedure - actions to be followed in sequence to successfully complete examination

1. Sequence and times to carry out each step may be specified

2. Making the equipment ready

3. Room set-up

4. Actual positioning of the patient

F. Postexamination orders - orders for patient to be carried out by nursing staff after the procedure

1. Dietary or medication orders may be prescribed for the patient after the procedure is complete

2. Example - patient who has been given barium sulfate should have a laxative to clear the colon of all barium

3. Example - patient who has had a myelogram should remain horizontal with no pillow to elevate the head for 24 hours following the procedure. (This helps to prevent headaches.)

III. Upper Gastrointestinal Series

A. Description of procedure

1. Check requisition form for exams ordered, history, signatures, patient's name and number.

2. Explain procedure to the patient.

B. Patient preparation

1. Nothing by mouth order on previous evening

2. Give patient dressing instructions.

C. Contrast medium

1. Obtain compound(s) needed for air contrast studies where applicable.

2. Mix barium sulfate.

D. Supplies and equipment

1. Place footboard on x-ray table and put it in the upright or recumbent position.

2. Check cameras for film and operation.

3. Prepare and help complete scout films.

4. Have adequate supply of film and other supplies.

5. Have emesis basin, washcloth and tissues ready for patient use.

E. Postexamination

1. Ensure procedure is completed and all pictures taken.

2. Return patient to his/her room.

3. Notify nursing staff the patient is back and exam completed.

4. Nursing staff will give the patient an appropriate amount of laxative.

IV. Lower Gastrointestinal Series

A. Description of procedure

1. Explain procedure to the patient

2. Check physician's requisition form for accuracy

B. Patient preparation

1. Day before procedure patient is on light liquid diet

2. Nothing by mouth orders at midnight

3. Bowel preparation orders

a. Laxative (bisacodyl tablets) - the day before procedure

b. Enema - the morning of examination

4. Give patient dressing instructions.

C. Contrast medium

1. Mix barium enema using correct concentration and type of barium.

2. Air contrast requires use of thick barium.

D. Supplies and equipment

1. Obtain correct balloon catheter rectal tip, enema bag and all other equipment for air contrast.

2. Ensure cameras are loaded and films are ready.

3. Secure use of adjacent bathroom for patient following the procedure.

4. Have towels and washcloth available for patient use.

5. Prepare examination table, examination equipment and radiographic machines.

E. Postexamination

1. Ensure films are acceptable and approved.

2. Return patient to his/her room.

3. Inform nursing staff the exam has been completed.

4. Nursing staff will give the patient a laxative after the procedure.

V. Summary and conclusion

A. Purpose of a radiology procedure manual

B. Procedure manual categories

C. Upper gastrointestinal series

D. Lower gastrointestinal series

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT X RADIOLOGY PROCEDURES

INTERACTION ITEMS:

1. Why do all radiology departments have procedure manuals?
2. Do all radiology procedures require the use of contrast media?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

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LESSON PLAN: 1

COURSE TITLE: LEVEL I MEDICATION TECHNICIAN

UNIT II DRUG CLASSIFICATIONS AND THEIR IMPLICATIONS

EVALUATION ITEMS

1. State the purpose of the procedure manual.

   a.

   b.

Briefly describe the content of each of the following categories:

2. Purpose of the procedure

3. Patient preparation

4. Contrast medium

5. Supplies and equipment

6. Steps of the procedure

7. Postexamination orders

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT X RADIOLOGY PROCEDURES

ANSWERS TO EVALUATION ITEMS

1. a. To reduce the number of variables by standardizing procedures

   b. To obtain accurate and dependable diagnostic results

2. Purpose of the procedure - to examine an organ by x-ray to determine if disease or abnormal function is present

3. Patient preparation - orders to be carried out by nursing staff prior to procedure to ensure patient is ready for examination

4. Contrast medium - material or compound used in the procedure to highlight the organ to be x-rayed

5. Supplies and equipment - x-ray equipment, film, and medical supplies necessary to complete the procedure

6. Steps of the procedure - actions to be followed in sequence to successfully complete examination

7. Postexamination orders - orders for patient to be carried out by nursing staff after the procedure

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT XI EQUIPMENT IDENTIFICATION

SCOPE OF UNIT:

This unit provides the student with an overview of the image producing machines and techniques currently in use in most modern radiology departments. The student will learn how each machine operates and what types of examinations each is used for.

INFORMATION TOPIC: X OR DEMONSTRATION:

RADIOLOGY EQUIPMENT AND TECHNIQUES
(Lesson Title)

LESSON OBJECTIVE - THE STUDENT WILL BE ABLE TO:

1. Identify the eight radiographic machines or techniques presented and described in this lesson.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. TM 1: Radiographic and Fluoroscopic Unit
2. TM 2: Computed Tomography Scanner
3. TM 3: Magnetic Resonance Scanner
4. TM 4: Gamma Camera
5. TM 5: Ultrasound Unit
6. TM 6: Digital Subtraction Angiography
7. TM 7: Portable X-ray Machine
8. TM 8: C-Arm Portable Fluoroscopic Unit

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

INTRODUCTION:

Radiographic images demonstrate anatomy (structure), or physiology (function) of an organ or body system. This unit introduces image producing devices used in the modern radiology department.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT XI EQUIPMENT IDENTIFICATION

OUTLINE: (Key Points)

I. Radiographic and Fluoroscopic Unit (R and F) (TM 1)

A. Radiographic unit - x-ray machine which sends a well-defined column of high energy radiation waves from down the x-ray tube, which pass through the body, creating an image on the photographic plate positioned underneath the patient.

B. Fluoroscopic - unit uses an electronic device called an image intensifier which passes low level radiation through the patient, converts it into a pattern of electrons which appears as a bright image when concentrated onto a fluorescent screen, and is usually displayed on a television monitor.

C. Examples of examinations performed with this unit

1. Routine x-rays of any part of the body (radiographic)

2. Upper gastrointestinal series (fluoroscopic)

3. KUB - kidney, ureter and bladder exam (radiographic)

II. Computed Tomography Scanner (CT Scanner) (TM 2)

A. First used in the U.S. in 1973 and in wide use by the 1980's

B. Originally called Computed Axial Tomography (CAT Scanner)

C. Unit components include an x-ray tube, two or more scintillation (radiation) detectors, and a computer with recording and display capacity.

D. Radiation detectors positioned opposite the x-ray tube revolve around the patient, sending x-rays through the body to the detection bank. The information is digitized and entered into the computer where it is calculated, stored, and then reconstructed as a series of transverse visual images of body tissues in cross-sectional slices. The images are displayed on a CRT or can be printed onto film.

E. Examples of body organs examined with this unit

1. Head, brain

2. Thorax

3. Abdomen

4. Spine

III. Magnetic Resonance Imaging (MRI) (TM 3)

A. First MRI units used in medicine commercially produced in 1984

B. MRI does not use x-rays to create the image; therefore, it theoretically poses no potential harm to patient

C. MRI produces energy waves when a strong, static magnetic field is interrupted by a high frequency radio signal produced by a transmitter. This information is picked up by computer, calculated, stored and then reconstructed as transverse cross-sectional images which are printed or displayed on a computer monitor.

D. The detail of images produced by the MRI unit exceeds the detail of the CT scanner images for almost every area of the body

E. Body organs examined with the MRI are the same as with the CT scanner

IV. Gamma Camera (TM 4)

A. Gamma rays are emitted from radioactive atoms

B. Gamma energy is higher than x-ray energy; therefore, potentially more harmful

C. A radioactive isotope called technetium is used in nuclear medicine as the media for scanning internal organs. It is injected prior to the procedure.

D. The gamma camera produces light when its crystal is struck by gamma radiation. Images of the distribution of radioactive material in the body organ are produced.

E. The collomated radiation is detected by a bank of radiation detectors and converted to electric signals for further processing by the computer. When there is enough data, the image is displayed on a CRT monitor or on film.

F. Examples of body organs examined with the gamma camera

1. Liver

2. Spleen

3. Skeletal structure

4. Brain

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V. Ultrasound Unit

A. Sound waves are not biologically harmful.

B. Ultrasonic sound waves have a very high frequency of over 20,000 vibrations per second

C. A transducer sends out high frequency sound waves, which are projected into the patient's body and bounced or echoed back by differing reflection signals to produce images of internal organs or structures. The image is displayed on a monitor and can be copied onto film.

D. Examinations using ultrasound

1. Fetal monitoring

2. Gallstones

3. Heart defects

4. Tumors

5. Blood vessels

VI. Digital Subtraction Angiography (DSA) (TM 6)

A. The same procedure as the image intensifier (fluoroscopic unit) but takes it further.

B. Signals coming from the image intensifier are put into the computer (digitized), processed and redisplayed.

C. Pictures are taken in very rapid succession after the contrast media has been injected. Everything that was pictured before the contrast media injection is subtracted by the computer, removing the anatomical background and leaving only the vessel images on the TV monitor.

VII. Portable X-ray Unit (TM 7)

A. Movable unit which produces radiographs using the same principle as the radiographic and fluoroscopic unit.

B. Used when a patient cannot be moved to the radiology department; e.g. a patient in the intensive care unit.

C. Limited in terms of the types of examinations for which it can be used

D. Most often used for chest x-rays

VIII. C-Arm Portable Fluoroscopic Unit (TM 8)

A. Movable unit using the same principle as the radiographic and fluoroscopic unit to produce fluorescent images which are displayed on a TV monitor.

B. Primarily used by doctors during surgery; e.g. to properly align and repair bones.

IX. Summary and Conclusion

A. Radiographic and fluoroscopic unit

B. Computed tomography scanner

C. Magnetic resonance imaging

D. Gamma camera

E. Ultrasound unit

F. Digital subtraction angiography

G. Portable x-ray unit

H. C-arm portable fluoroscopic unit

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT XI EQUIPMENT IDENTIFICATION

INTERACTION ITEMS:

1. Which pieces of radiographic equipment utilize a computer to analyze data and form the images?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

LESSON PLAN: 1

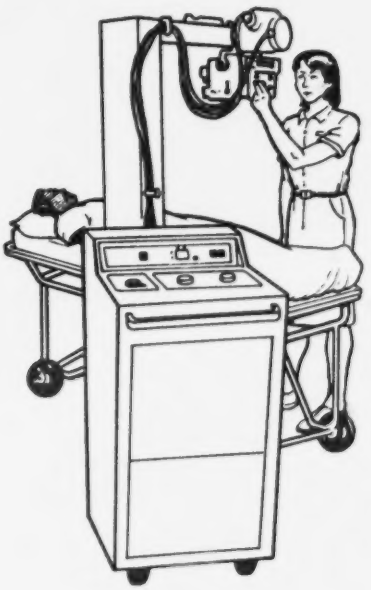
COURSE TITLE: RADIOLOGY AIDE

UNIT XI EQUIPMENT IDENTIFICATION

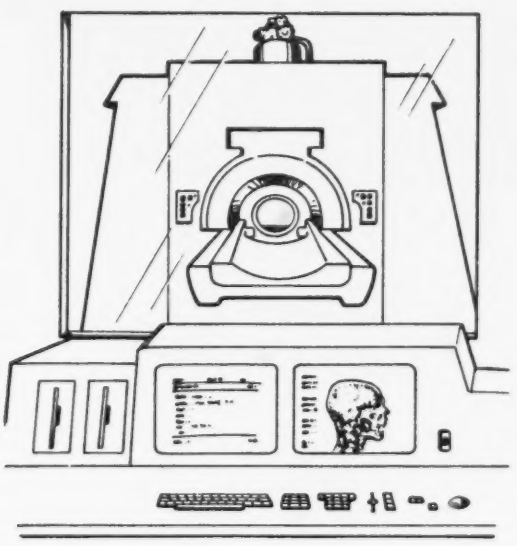
EVALUATION ITEMS

Identify the eight image-producing machines or techniques shown on these pages by writing the correct name in the space provided.

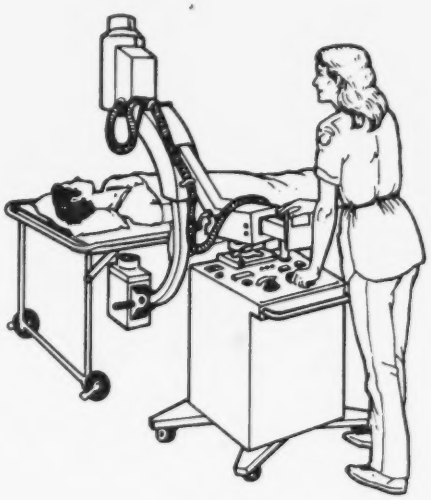
A. _____



B. _____



C. _____



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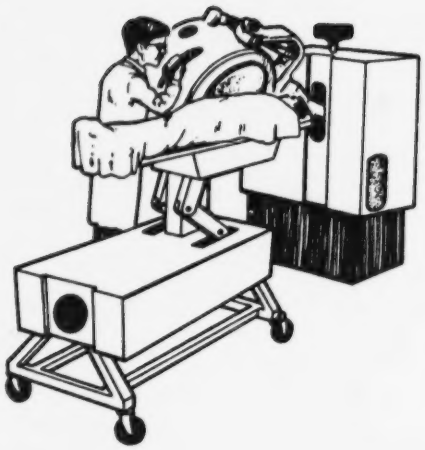
E. _____



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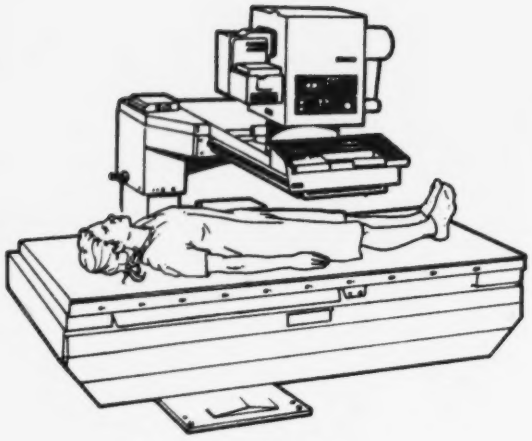

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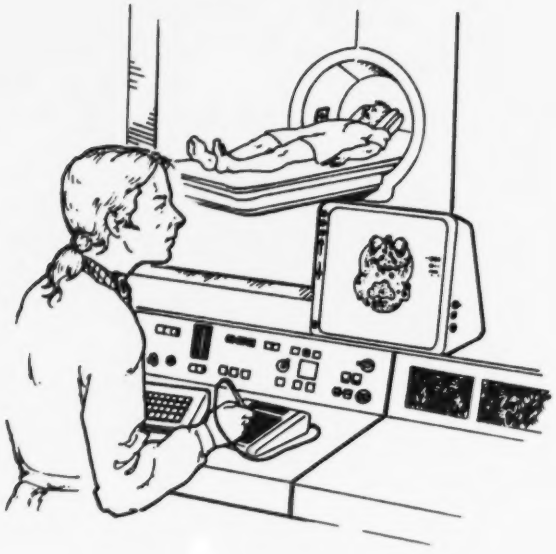

H. _____

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LESSON PLAN: 1

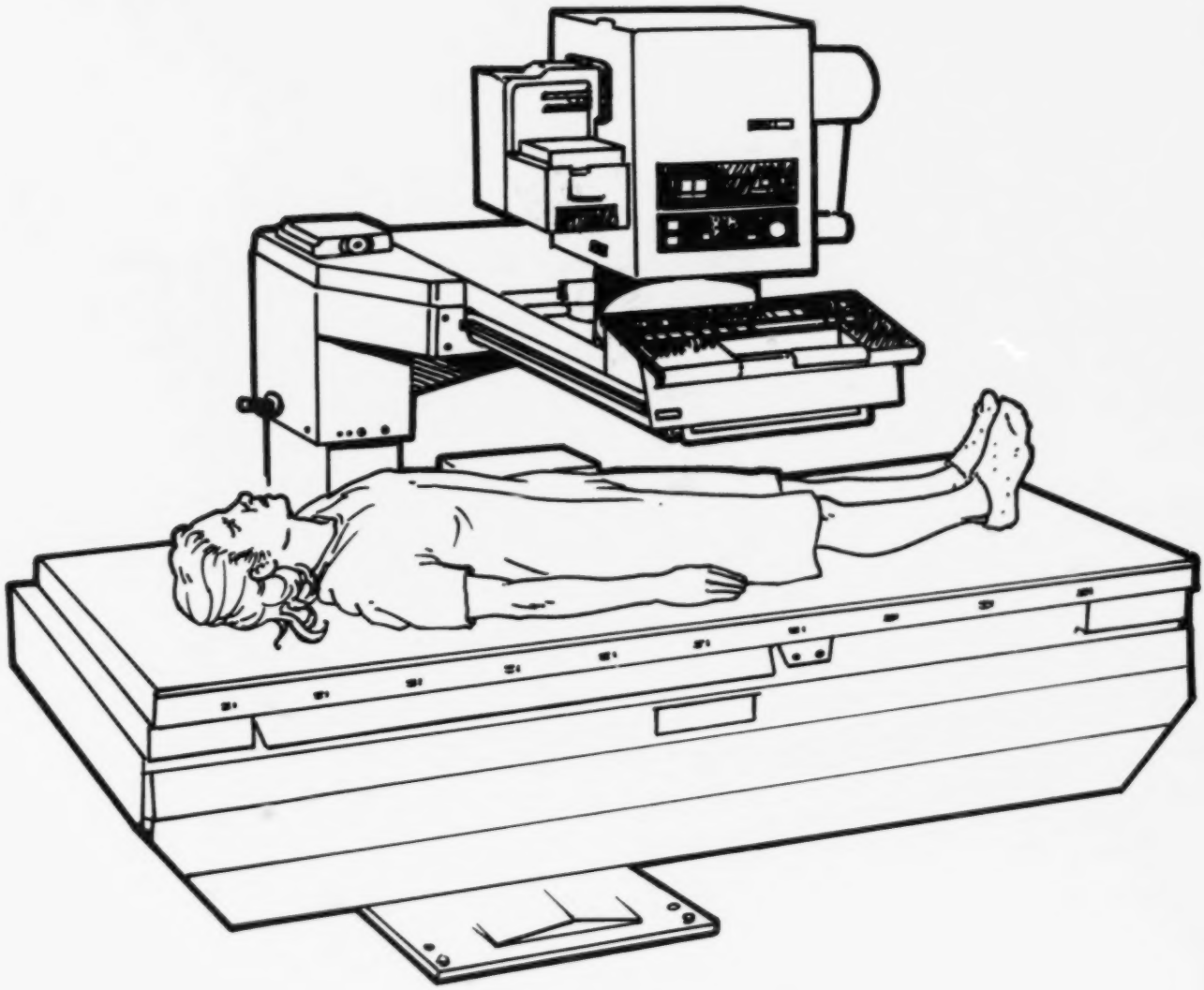
COURSE TITLE: RADIOLOGY AIDE

UNIT XI EQUIPMENT IDENTIFICATION

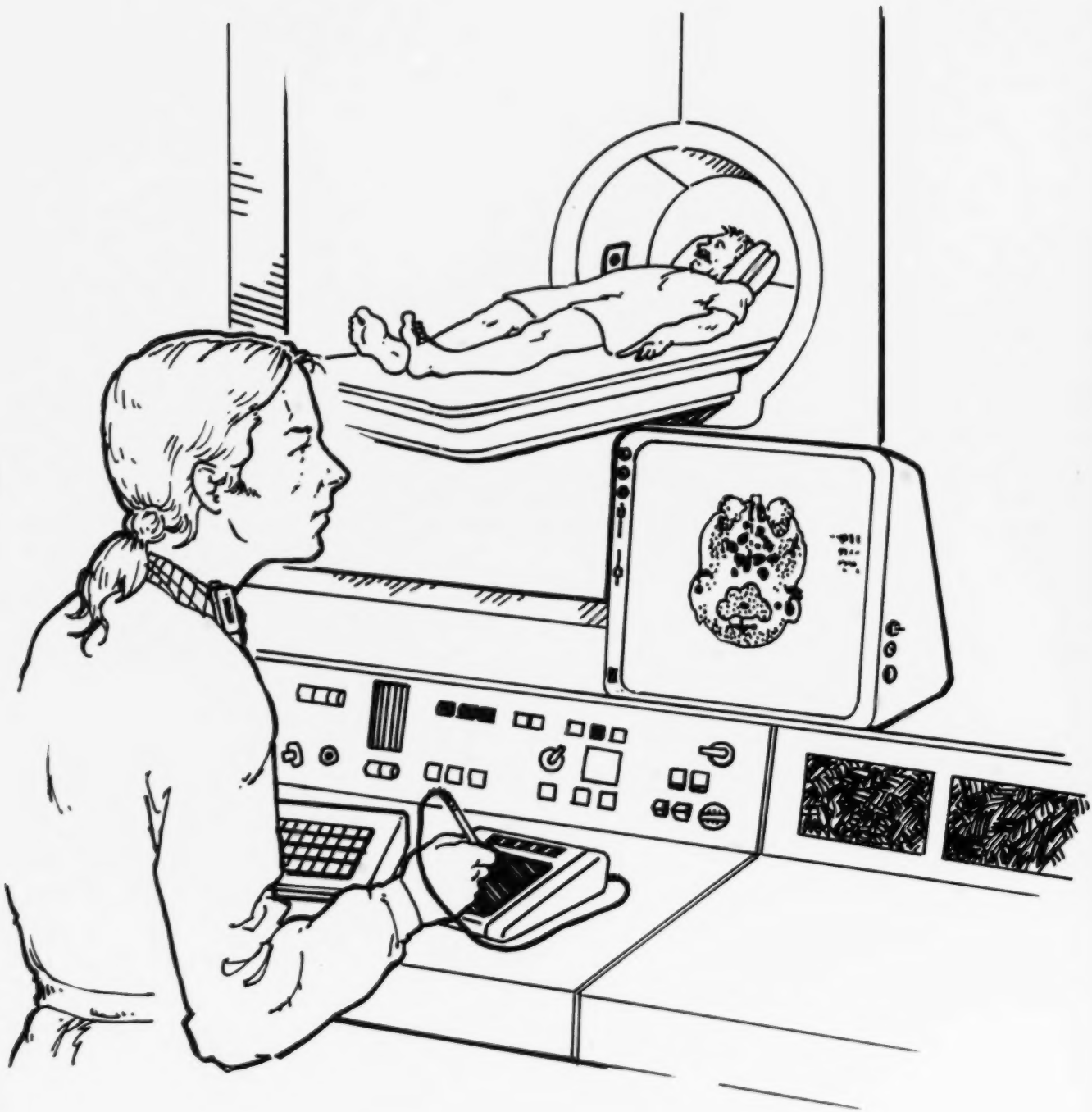
ANSWERS TO EVALUATION ITEMS

A. Ultrasound unit
B. Portable x-ray machine
C. Magnetic resonance scanner
D. C-arm portable fluoroscopic unit
E. Digital subtraction angiography
F. Gamma camera
G. Radiographic and fluoroscopic unit
H. Computed tomography scanner

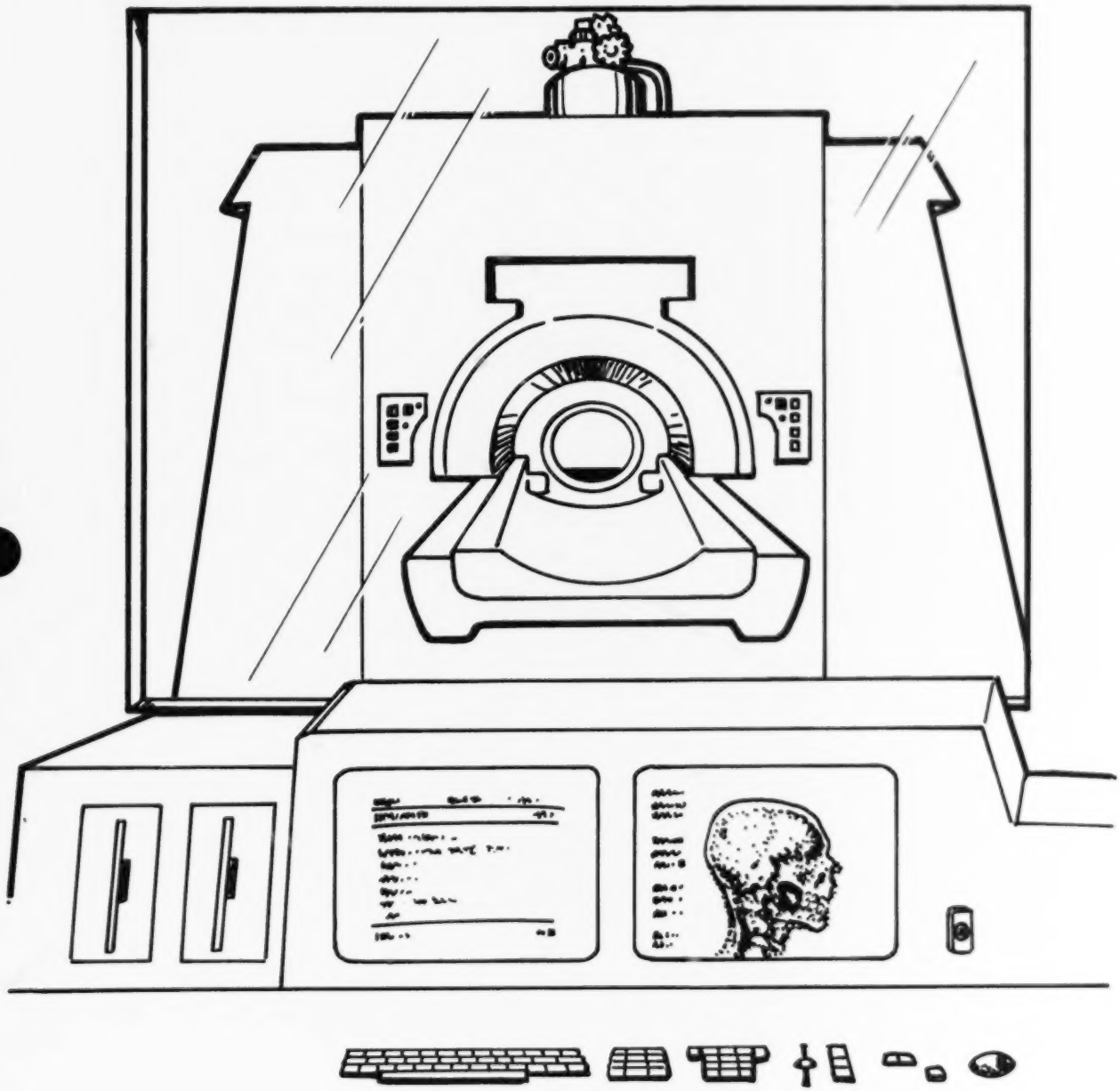
Radiographic and Fluoroscopic Unit



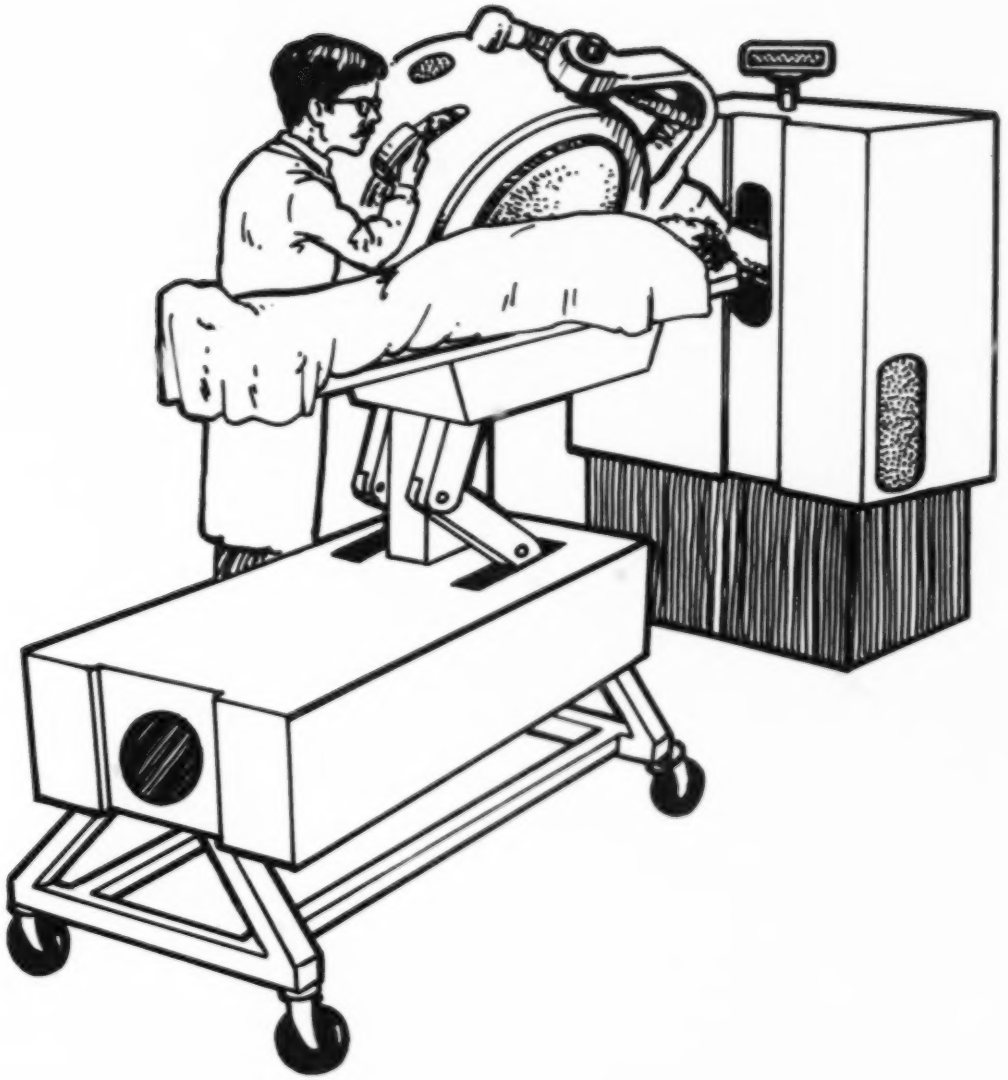
Computed Tomography Scanner



Magnetic Resonance Scanner



Gamma Camera



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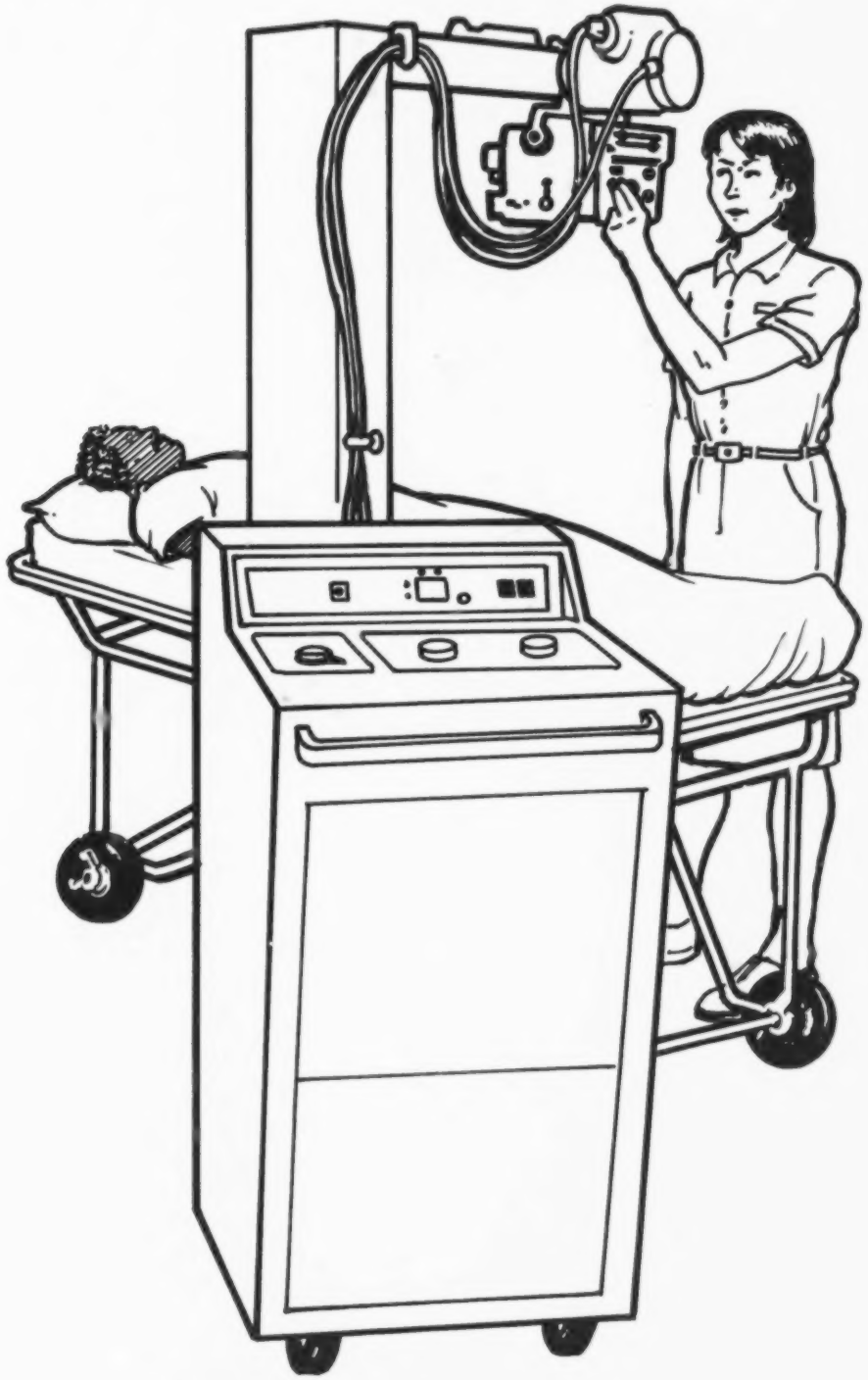
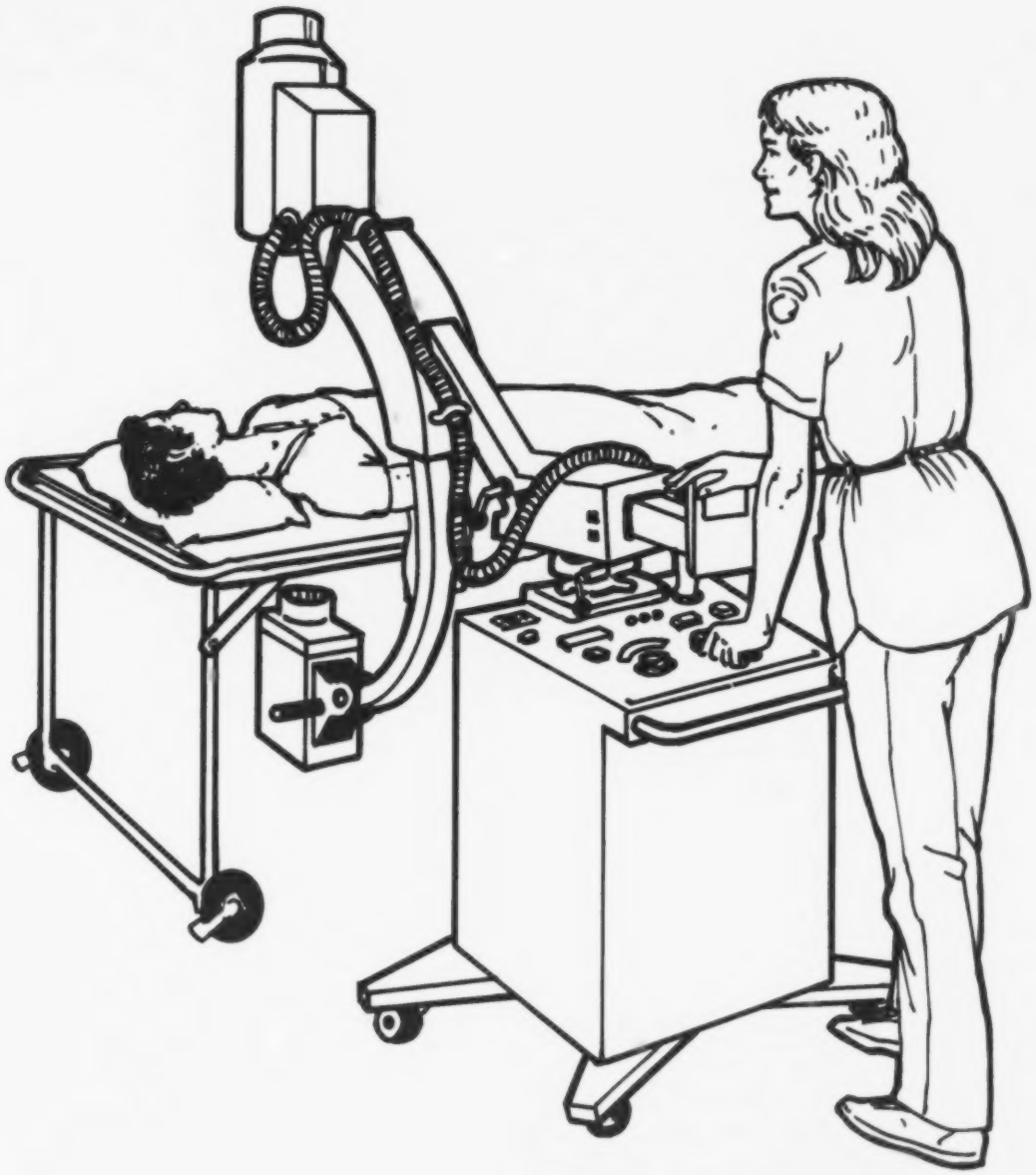
Ultrasound Unit

Digital Subtraction Angiography (DSA)

Portable X-Ray Machine



C-Arm Portable Fluoroscopic Unit



LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT XII EQUIPMENT CLEANING AND MAINTENANCE

SCOPE OF UNIT:

This unit focuses on the importance of cleaning and maintaining the examination rooms and the image producing equipment in the Radiology department. It will outline proper procedures for routine and preventive maintenance of x-ray machines, cassette intensifying screens and automatic film processors.

INFORMATION TOPIC: X OR DEMONSTRATION:

EQUIPMENT CLEANING AND MAINTENANCE
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. State the difference between scheduled maintenance, preventive maintenance, and nonscheduled maintenance.
2. State three reasons for routine cleaning of x-ray equipment.
3. List two solutions that can be used as a germicide to sanitize x-ray equipment.
4. Describe the procedure for cleaning intensifying screens in film cassettes.
5. Describe the routine cleaning that should be completed on a film processor.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. HO 1: Cleaning Intensifying Screens

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

Eastman Kodak Company. The Fundamentals of Radiography, Publication No. MI-18, order from: Eastman Kodak Company, Rochester, New York 14650. Cost - $5.00

INTRODUCTION:

Routine maintenance of high technology equipment is an extremely important and cost saving task. Cleaning any piece of equipment requires care and, in many cases, use of a standard procedure. Special cleaning solutions may be needed or special care must be taken to prevent damage to sensitive equipment. Cleaning and routine maintenance of image producing equipment and accessories is a job that the radiology aide can effectively do with proper instruction and limited supervision from the radiology department staff. This unit deals with cleaning intensifying screens in film cassettes, cleaning automatic film processors, and routine sanitary cleaning of x-ray machines.

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT XII EQUIPMENT CLEANING AND MAINTENANCE

OUTLINE: (Key Points)

I. Types of Maintenance

A. Scheduled Maintenance

1. Routine inspection and cleaning of equipment

2. While cleaning and lubricating machines:

a. Check belts, pulleys or gears that may need adjustment.

b. Note parts that are getting worn and need replacement.

3. Bring your observations to the attention of the chief technologist. The aide should not make adjustments and repairs to equipment.

B. Preventive Maintenance

1. Planned program of replacement of parts that tend to wear out.

2. Some gears, rollers or springs of the automatic film processor may be replaced annually (or more often) even if the machine is not malfunctioning.

3. Prevents failure at critical times such as during emergency procedures

C. Nonscheduled Maintenance

1. Repair is required due to equipment breakdown

2. Usually requires the procedure or exam to be repeated

3. Emergency repairs are undesirable in terms of time, cost, and patient care.

II. Reasons for Routine Cleaning of Equipment

A. Clears away disease-producing microorganisms (sanitizes)

B. Removes dirt and dust that contributes to wear and tear on equipment

C. Provides opportunity for regular inspection of equipment

D. Clean equipment and examination rooms

1. Maintains hospital standards

2. Preserves the professional appearance of the radiology department

III. Cleaning Solutions

A. Sanitizing solutions

1. Lysol (.5 to 2% cresol)

2. Chlorox (sodium hydrochlorite)

3. Alcohol (isopropol 70%)

4. Soap and water

5. LPH

6. Zephiran (benzalkonium chloride)

7. Phenol (carbolic acid 2-5%)

B. Special cleaning solutions

1. Stainless steel

2. Monitors (cathode ray tubes)

C. Situations requiring immediate cleaning

1. Following examinations that require barium sulfate

2. Following examinations of trauma cases where blood was present

3. Cleaning is easily accomplished with soap and water before the barium or blood dries. Dried barium or blood is much more difficult to remove.

IV. Cleaning Intensifying Screens (HO 1)

INSTRUCTOR NOTE: Advise students that this procedure must be done under supervision and should not be attempted without initial training.

A. Unload cassettes in the darkroom placing the film into the appropriate box in the film bin or into a light-impermeable sealed envelope. It is best to clean all cassettes of a particular size during the same day.

B. Examine the intensifying screens for nicks and obvious damage.

C. Follow the cleaning procedure using the cleaning solution supplied for this purpose.

D. Allow the cassette to dry.

E. Note that the screen has been cleaned on the cassette sticker or in the department cleaning records.

F. Reload the cassette in the darkroom and place the cassette in a film passbox.

V. Cleaning Automatic Film Processors

INSTRUCTOR NOTE: Advise students that this procedure must be done under supervision and should not be attempted without initial training.

A. Movable parts

1. Remove the crossover rollers.

2. Inspect and note signs of wear or other abnormalities.

3. Clean the roller in running water that is at room temperature.

4. Mild abrasive cleaning pads may be used to clean off excess chemical deposits.

B. Nonmovable parts - clean off excess chemical deposits on parts of the processor that are not immersed in the solution tanks.

VI. Summary and Conclusion

A. Types of maintenance

B. Reasons for routine cleaning of equipment

C. Cleaning solutions

D. Cleaning intensifying screens

E. Cleaning automatic film processors

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT XII EQUIPMENT CLEANING AND MAINTENANCE

INTERACTION ITEMS:

1. Why is unscheduled maintenance undesirable?
2. Why is cleaning an important task?

CLASSROOM, LABORATORY, AND OTHER ACTIVITIES:

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT XII EQUIPMENT CLEANING AND MAINTENANCE

EVALUATION ITEMS

Directions: Use A, B, or C listed below to match to the statements made for questions 1 through 5.

A. Scheduled maintenance
B. Preventive maintenance
C. Unscheduled maintenance

_____ 1. Routine cleaning

_____ 2. Routine tightening of screws, belts, chains and lubrication

_____ 3. Breakdown of equipment with emergency repair

_____ 4. Replacement of worn parts before a breakdown occurs

_____ 5. Annual replacement of rollers and gears in a film processor

True and False

For each of the following, write "T" if the statement is true, or "F" if it is false.

_____ 6. Cleaning is the first step to maintaining the working order of x-ray equipment.

_____ 7. Dust and dirt accumulation on equipment may carry disease-producing microorganisms.

_____ 8. Alcohol, Lysol and Chlorox can be used to sanitize equipment.

_____ 9. The x-ray tabletop and other surfaces that the patient comes into contact with must be sanitized after each patient.

_____ 10. Blood and barium are best cleaned after they dry.

_____ 11. Film should be unloaded from cassettes in a well-lit room.

_____ 12. After the intensifying screen has been cleaned, the date must be noted on the cassette sticker or in the department's cleaning records.

_____ 13. When cleaning intensifying screens and film processors, it is not necessary to examine them for wear and tear.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT XII EQUIPMENT CLEANING AND MAINTENANCE

ANSWERS TO EVALUATION ITEMS

1. A
2. A
3. C
4. B
5. B
6. T
7. T
8. T
9. T
10. F
11. F
12. T
13. F

Cleaning Intensifying Screens

Intensifying screens, as the name implies, intensify the effect of x-rays on radiographic film. They allow us to actually reduce the amount of radiation that we would otherwise use to make a radiograph. The screens are manufactured with varying characteristics such as speed, intensity or resolution.

Film cassettes are opened in the darkroom to remove an exposed film and replace it with a fresh film. During this brief period of time, the screen is exposed to dust particles in the air and on the film. Over a period of time, the screens will accumulate enough dust and particulate matter that, if not cleaned away, may destroy the surface of the screens and reduce their effectiveness.

Regular cleaning of the intensifying screens must be a part of the scheduled maintenance program. Most departments keep records on the frequency of screen cleaning to ensure that it is carried out on a regular basis. It is important to follow the manufacturer's guidelines for cleaning screens because the methods and solutions may vary somewhat from one type of screen to another.

The following procedure is generally used:

1. Unload cassettes in the darkroom placing the film into the appropriate box in the film bin or into a light tight sealed envelope. It is best to clean all cassettes of a particular size during the same day.

2. Examine the screens for nicks and obvious damage. Examine the hinges and latches of the cassette to determine that they are secure and working properly. Report any suspected problems to a supervising technologist.

3. Follow the cleaning procedure and use the cleaning solution recommended by the manufacturer.

4. Allow the cassette to dry.

5. Document that the screen has been cleaned on the cassette sticker or in the department cleaning records.

6. Reload the cassette in the darkroom and place the cassette in a film passbox.

This task must be completed only after the Aide has been trained by a radiology department staff member to do the task and then only with some supervision.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT XIII COMPUTER BASICS AND APPLICATION

SCOPE OF UNIT:

This unit provides basic information about computers and their application in the modern radiology deparment. Because the computer is an integral part of many image producing machines, an understanding of how it functions is essential.

INFORMATION TOPIC: X OR DEMONSTRATION:

COMPUTER BASICS AND APPLICATION
(Lesson Title)

LESSON OBJECTIVES - THE STUDENT WILL BE ABLE TO:

1. List five computer functions.
2. Match four computer hardware components with their proper descriptions.
3. State the difference between hardware and software.
4. State the definition of real time processing.
5. Identify computer assisted radiographic equipment.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

INFORMATIONAL ASSIGNMENT: (Student)

REFERENCES: (Instructor's Additional Information)

Convey, H. Dominec and Neil H. McAlister. Computer Consciousness. Reading, MA: Addison-Wesley Publishing Company, 1980.

Shelly, Gary B. and Thomas J. Cashman. Computer Fundamentals for an Information Age. Brea, CA: Anaheim Publishing Company, 1984.

INTRODUCTION:

Computers have become an important part of daily life. In the radiology department, computers are an integral part of many image producing machines and therefore, essential to the diagnostic process. This lesson will first introduce computer functions and components, including hardware and software. The second part will focus on the application of computers in the radiology department and the equipment which uses them.

LESSON PLAN: 1

COURSE TITLE: RADIOLOGY AIDE

UNIT XIII COMPUTER BASICS AND APPLICATION

OUTLINE: (Key Points)

I. Computer Basics

A. Functions

1. Input operation - accepts data for processing

2. Arithmetic operation - performs addition, subtraction, multiplication and division calculations

3. Logical operation - compares data and determines if one value is less than, equal to, or greater than another value

4. Output operation - makes processed information available for use

5. Storage operation - electronically stores data on external device for future reference

B. Components

1. Hardware - actual physical pieces of computer equipment

a. Input unit - device used to enter data into computer; most often a keyboard, but also light pens, optical readers or as in a C.T. scanner, a bank of radiation detectors

b. Processor unit - has two distinct parts

(1) Main memory - stores processing instructions, and data as it is entered

(2) Central processing unit (CPU) - electronic circuitry which process data by executing instructions and controlling input, output, and storage functions

c. Output unit - device which makes processed information available; can be printed or visual images (e.g. cathode ray tube)

d. Auxiliary storage unit - electronically stores data and processing instructions as magnetic spots on floppy disks (diskettes) or hard disks when information is not being used by main memory

2. Software - programs which direct the computer to perform various functions

   a. Programs - a set of instructions written in numeric code

   b. Systems software - programs on disk that start up the computer after it has been turned on; loads the processing unit with application programs, execution instructions, storage, retrieval, and other utility functions

   c. Applications software - programs which perform specific tasks

   d. Computer programmers - professionals who write the complicated programs in such a way that the user is able to obtain the desired results

II. Computers in the Radiology Department

A. Computers which are part of image producing equipment use real time processing, also called interactive processing.

B. Real time or interactive processing means data is entered as a single field or piece of information or as a group of fields, immediately processed with output immediately produced.

C. Immediate, continuous processing of data provides measurement of all possible variables which can be present when diagnosing disease or abnormal organ function.

D. Central processing unit of computer analyzes data and stores it in the main memory until given the output command, at which time the diagnostic image is reconstructed and displayed on a cathode ray tube.

E. Computer-created images can be altered to improve the quality of the picture by entering commands via the keyboard.

F. Image alterations could include

   1. Contrast - more or less gray tone

   2. Elimination of bone structures from image, leaving clearer picture of soft tissue (subtraction)

G. Computer assisted equipment

INSTRUCTOR NOTE: Review the role of the computer for each piece of the following equipment as discussed in Unit XI, Lesson 1.

   1. Radiographic and fluoroscopic unit

   2. Computed tomography scanner

3. Magnetic resonance imaging

4. Nuclear medicine scanner

5. Ultrasound unit

6. Digital subtraction angiography

III. Summary and Conclusion

A. Computer basics

B. Computers in the radiology department

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT XIII COMPUTER BASICS AND APPLICATION

INTERACTION ITEMS:

1. What are some of the areas in our daily life that are affected by computers?
2. How does computer technology influence the radiology department?

CLASSROOM, LABORATORY, OR OTHER ACTIVITIES:

LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT XIII COMPUTER BASICS AND APPLICATION

EVALUATION ITEMS

1. List the five functions of every computer.

   a.
   b.
   c.
   d.
   e.

2. Match the following computer components with the proper description.

___	a.	Auxiliary storage	A.	Device used to enter data into computer
___	b.	Input unit	B.	Composed of main memory and central processing unit
___	c.	Processor unit	C.	Holds data and processing instructions when information is not being used
___	d.	Output unit	D.	Device used to make processed information available

3. Briefly state the difference between hardware and software.

4. Circle the letter in front of the phrase which best describes real time processing.

   A. Data records accumulated and processed as a group after all information has been gathered.

   B. Processing that allows user to prepare letters and memos using the computer.

   C. Data is entered as a single field, processed immediately and output produced immediately.

5. Place an "x" in front of each image producing machine which makes use of a computer.

___ A. Radiographic and fluoroscopic unit
___ B. Computed tomography scanner
___ C. Magnetic resonance imaging
___ D. Nuclear medicine scanner
___ E. Ultrasound unit
___ F. C-arm portable fluoroscopic unit
___ G. Digital subtraction angiography
___ H. Portable x-ray unit
___ I. Any unit which has a digital display

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LESSON PLAN: I

COURSE TITLE: RADIOLOGY AIDE

UNIT XIII COMPUTER BASICS AND APPLICATION

ANSWERS TO EVALUATION ITEMS

1. A. Input operation
   B. Arithmetic operation
   C. Logical operation
   D. Output operation
   E. Storage operation

2. a. C
   b. A
   c. B
   d. D

3. Hardware - the actual physical pieces of computer equipment

   Software - programs which direct the computer to perform various functions

4. C

5. x A
   x B.
   x C.
   x D.
   x E.
   ___ F.
   x G.
   ___ H.
   x I.

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Convey, H. Dominec and Neil H. McAlister. Computer Consciousness. Reading, MA: Addison-Wesley Publishing Company, 1980.

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Gurley, LaVerne T. and William Callaway. Introduction to Radiologic Technology. St. Louis: C.V. Mosby Publishing Company, 1985.

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Spirko, Sister Christina. Radiologic Records. Springfield, IL: Charles C. Thomas Publisher, 1974.

Competency Certificate

This is to Certify that:

_____

Achieved the Job Competencies
as Acknowledged for

Radiology Aide

And is Therefore Recognized

This _____ *Day of* _____ *, 19* _____

_____ _____

Instructor *Administrator*

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Competency Profile for Radiology Aide

Student Name: _____

Permanent Address: _____

Social Security Number: _____ Instructor's Signature: _____

Directions: This profile provides a permanent record for student, instructor, and/or industry representative. The competencies listed below correspond directly to the lessons presented in this curriculum guide. Compile your evaluation of the student (trainee) by transferring the appropriate "yes/no" rating from the various demonstration lessons, or by indicating "yes/no" if the student (trainee) has mastered objectives contained in information lessons.

YES	NO	
		Introduction To Radiology
—	—	1. Identify the scientist who discovered x-rays and the date of discovery.
—	—	2. List characteristics of x-ray energy.
—	—	3. Explain how x-rays are produced.
—	—	4. List steps in the production of a radiograph.
YES	NO	**Terminology Related to Radiology**
—	—	5. List and define the three parts of a word.
—	—	6. Identify correct definitions of word parts.
—	—	7. Identify correct definitions of medical terms.
—	—	8. Identify correct definitions of radiology terms.
—	—	9. Identify job titles and descriptions of radiology workers.
YES	NO	**Basic Telephone Techniques**
—	—	10. List criteria for answering incoming telephone calls.
—	—	11. List steps in taking a phone message.
—	—	12. Identify the proper method of terminating a telephone conversation.
—	—	13. Identify effective and ineffective telephone techniques.
—	—	14. Respond professionally to business telephone conversations.
YES	NO	**The Value of Radiology Records**
—	—	15. Identify the immediate value of radiology records.
—	—	16. State the purpose of the radiologist's report.
—	—	17. Discuss confidential aspects of radiology records.
—	—	18. Discuss ownership of radiology records.
—	—	19. State the length of time that radiographs and reports must be retained.
—	—	20. State requirements that must be met for records to be admissible in court.
—	—	21. Complete treatment records and forms used in the radiology department.
YES	NO	**Darkroom Procedures**
—	—	22. Identify correct definitions of terms related to rapid film processing.
—	—	23. Identify elements of rapid processing.
—	—	24. Identify the steps of processing x-ray film.
YES	NO	**Nature and Characteristics of Radiation**
—	—	25. Identify characteristics of alpha and beta particles and gamma radiation.
—	—	26. Describe the production of x-rays.
—	—	27. Identify properties of radiation.
—	—	28. Describe requirements for shielding the body from radiation.
—	—	29. Define terms associated with radiation safety.
—	—	30. Compute maximum permissible dose (MPD) for a radiation worker.
—	—	31. Identify the approximate average radiation dose received by a radiologist in one year.
—	—	32. Discuss the relationship between exposure time and the dose of radiation received.
—	—	33. Discuss the relationship between the distance from the source and the amount of radiation received.
—	—	34. Discuss the composition and usage of shielding devices.
—	—	35. Discuss concept of fractionation of dosage.
—	—	36. Identify types of radiation produced during an x-ray procedure.
YES	NO	**Microbiology, Microorganisms, and Basic Terminology of Infection Control**
—	—	37. Define microbiology.
—	—	38. Identify types of microorganisms.
—	—	39. Define terminology related to infection control.
—	—	40. Discuss methods of infection control.
—	—	41. Identify objects in the radiology department that should be disinfected regularly.
—	—	42. Identify objects in the radiology department that are considered disposable and should not be reused.
—	—	43. Identify methods of sterilization.
—	—	44. Describe applications of autoclave sterilization.
—	—	45. Describe applications of chemical gas sterilization.
—	—	46. Identify rules to observe when working in or near a sterile field.
—	—	47. Identify types of isolation.
—	—	48. Identify precautions associated with isolation procedures.
YES	NO	**Transporting Patients**
—	—	49. Define center of gravity as it relates to an object being lifted.
—	—	50. Describe the proper body stance for lifting an object.
—	—	51. Identify principles of lifting.
—	—	52. Move patient from bed or x-ray table to a cart.
—	—	53. Move patient from a sitting position to a wheelchair.
YES	NO	**Patient Preparation for Examination**
—	—	54. Identify types of physician's orders used for patient preparation for a radiographic exam.
—	—	55. Identify types of patient's dress and the exams for which they are required.
—	—	56. Define radiographic artifacts and what common items cause them to occur.
YES	NO	**Radiology Procedures**
—	—	57. Describe the content and purpose of a radiology procedure manual.
YES	NO	**Equipment Identification**
—	—	58. Identify radiographic machines and techniques.
YES	NO	**Equipment Cleaning and Maintenance**
—	—	59. Differentiate between scheduled maintenance, preventive maintenance, and nonscheduled maintenance.
—	—	60. State the purpose for cleaning x-ray equipment.
—	—	61. Identify germicides used in the radiology department.
—	—	62. Describe the procedure for cleaning intensifying screens in film cassettes.
—	—	63. Describe routine cleaning of a film processor.
YES	NO	**Computer Basics and Application**
—	—	64. List five computer functions.
—	—	65. Identify descriptions of computer hardware.
—	—	66. Differentiate between hardware and software.
—	—	67. Define real time processing.
—	—	68. Identify computer assisted equipment.